

**B.Sc. INFORMATION TECHNOLOGY - CURRICULUM STRUCTURE****CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)**

(Applicable to the candidates admitted from the academic year 2026 - 2027 onwards)

Sem	Part	Courses	Title	Ins. Hrs.	Credits	Exam. Hours	Maximum Marks		
							Int.	Ext.	Total
I	I	Ability Enhancement Course – I (AEC - I)	(Tamil \$ / Other Languages +, #)	6	3	3	30	70	100
	II	Ability Enhancement Course – II (AEC - II)	English Course – I	6	3	3	30	70	100
	III	Core Course - 1 (CC - 1)	Programming in C and Data Structures	4	4	3	30	70	100
		Core Practical - 1 (CP - 1)	Programming in C and Data Structures Lab	4	4	3	40	60	100
		Allied Course – 1 (AC - 1)	Any one from the list	4	4	3	30	70	100
		Allied Course Practical - I (MCP-I)	Any one from the list	2	**	**	**	**	**
	IV	Value Education		2	2	3	30	70	100
		Interdisciplinary Course – 1 (IDC - 1) #	One Course from Outside Department	2	2	3	30	70	100
	Total			30	22	–	–	–	700
II	I	Ability Enhancement Course – III (AEC - III)	(Tamil \$ / Other Languages +, #)	6	3	3	30	70	100
	II	Ability Enhancement Course – IV (AEC - IV)	English Course - II	6	3	3	30	70	100
	III	Core Course - 2 (CC - 2)	Programming in Java	4	4	3	30	70	100
		Core Practical - 2 (CP - 2)	Object Oriented Programming using Java Lab	4	4	3	40	60	100
		Allied Course – 2 (AC - 2)	Any one from the list	4	4	3	30	70	100
		Allied Course Practical - I (AP-I)	Any one from the list	2	4	3	40	60	100
	IV	Skill Enhancement Course - 1 (SEC - 1) ##	Naan Mudhalvan Course	2	2	3	30	70	100
		Interdisciplinary Course – 2 (IDC - 2) #	One Course from Outside Department	2	2	3	30	70	100
	Total			30	26	–	–	–	800

III	I	Ability Enhancement Course – V (AEC - V)	(Tamil \$ / Other Languages +, #)	6	3	3	30	70	100
	II	Ability Enhancement Course – VI (AEC - VI)	English Course - III	6	3	3	30	70	100
	III	Core Course - 3 (CC - 3)	Programming in Python	4	4	3	30	70	100
		Core Practical - 3 (CP - 3)	Programming in Python Lab	4	4	3	40	60	100
		Allied Course – 3 (AC - 3)	Any one from the list	4	4	3	30	70	100
		Allied Course Practical - II (AP-II)	Any one from the list	2	**	**	**	**	**
	IV	Skill Enhancement Course - 2 (SEC - 2) ##	Naan Mudhalvan Course	2	2	3	30	70	100
		Interdisciplinary Course – 3 (IDC - 3) \$\$	One Course from Outside Department	2	2	3	30	70	100
		Health & Wellness @		–	1	–			100
	Total			30	23	–	–	–	800
I	Ability Enhancement Course – VII (AEC - VII)	(Tamil \$ / Other Languages +, #)	6	3	3	30	70	100	
IV	II	Ability Enhancement Course – VIII (AEC - VIII)	English Course - IV	6	3	3	30	70	100
	III	Core Course - 4 (CC - 4)	RDBMS and NoSQL	4	4	3	30	70	100
		Core Practical - 4 (CP - 4)	RDBMS and NoSQL Lab	4	4	3	40	60	100
		Allied Course – 4 (AC - 4)	Any one from the list	4	4	3	30	70	100
		Allied Course Practical - II (AP-II)	Any one from the list	2	4	3	40	60	100
	IV	Skill Enhancement Course - 3 (SEC - 3) ##	Naan Mudhalvan Course	2	2	3	30	70	100
		Interdisciplinary Course – 4 (IDC - 4) \$\$	One Course from Outside Department	2	2	3	30	70	100
	Total			30	26	–	–	–	800
Summer Internship / Industrial Activity during the Summer Vacation after II Year									

V	III	Core Course - 5 (CC - 5)	Shell Programming	4	4	3	30	70	100
		Core Course - 6 (CC - 6)	Fundamentals of Algorithms	5	4	3	30	70	100
		Core Course - 7 (CC - 7)	Cloud Computing	5	4	3	30	70	100
		Core Course - 8 (CC - 8)	Software Engineering	5	4	3	30	70	100
		Core Practical - 5 (CP - 5)	Shell Programming Lab	5	4	3	40	60	100
	IV	Skill Enhancement Course - 4 (SEC - 4)	Any one from the list	2	2	3	30	70	100
		Skill Enhancement Course - 5 (SEC - 5) ##	Naan Mudhalvan Course	2	2	3	30	70	100
		Introduction to Disaster Management		2	2	3	30	70	100
		Summer Internship / Industrial Activity @@	(with Viva-Voce)	--	2	--	20	80	100
	Total			30	28	--	--	--	900
VI	III	Core Course - 9 (CC - 9)	Data Communication and Networks	4	4	3	30	70	100
		Core Course - 10 (CC - 10)	Multimedia Systems	5	4	3	30	70	100
		Core Course - 11 (CC - 11)	Artificial Intelligence and Data Science	5	4	3	30	70	100
		Core Project Work (CPW) @@	Project Work (with Viva-Voce)	6	4	3	20	80	100
	IV	Value Added Course	General Studies for Competitive Examinations	2	1	--	30	70	100
		Skill Enhancement Course - 6 (SEC - 6)	Any one from the list	2	2	3	30	70	100
		Skill Enhancement Course - 7 (SEC - 7) ##	Naan Mudhalvan Course	2	2	3	30	70	100
		Environmental Studies		2	2	3	30	70	100
		Gender Studies		2	1	3	30	70	100
		Extension Activities *		--	1	--	--	--	--
	Total			30	25	--	--	--	900
Grand Total			180	150	--	--	--	4900	

ALLIED COURSE

First Year Students

Mathematics

Second Year Students

Applied Physics / Electronics

SKILL ENHANCEMENT COURSE (SEC)			
Sl. No.	Title of paper	Sl. No.	MANDATORY Naan Mudhalvan Scheme ##
1.	Computer Graphics	1.	2nd Semester:
2.	Big Data Analytics		
3.	Mobile Application Development	2.	3rd Semester:
4.	Data Mining		
5.	Internet of Things	3.	4th Semester:
6.	Cyber Security		
7.	Virtual Reality and Augmented Reality	4.	5th Semester:
--		5.	6th Semester:

INTERDISCIPLINARY COURSE (IDC) FOR WHO HAVE OPT TAMIL AS PART - I	
1 st Semester	Fundamentals of Information Technology
2 nd Semester	Working Principles of Internet
3 rd Semester	Web Design
4 th Semester	Digital Marketing

INTERDISCIPLINARY COURSE (IDC) # FOR WHO HAVE NOT OPT TAMIL AS PART - I		
Those who have studied Tamil upto 10 th +2 but opt for other languages in degree	1 st Semester	Special Tamil - I
	2 nd Semester	Special Tamil - II
Those who have not studied Tamil in school level	1 st Semester	Basic Tamil - I
	2 nd Semester	Basic Tamil – II

INTERDISCIPLINARY COURSE (IDC) \$\$ FOR NCC CADETS ONLY	
NCC Course is a Compulsory Course for the NCC Cadets in the 3rd Semester:	NCC Course is a Compulsory Course for the NCC Cadets in the 4th Semester:
Introduction to NCC	1. Special Subject Army (or) 2. Special Subject Navy (or) 3. Special Subject Air force

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	Credits for each Course	Total Credits	Marks
1.	I	Ability Enhancement Course	4	3	12	400
2.	II	Ability Enhancement Course	4	3	12	400
3.	III	Core Course	11	4	44	1100
4.		Core Practical	5	4	20	500
5.		Allied Course (AC)	4	4	16	400
6.		Allied Course Practical (AP)	2	4	8	200
7.		Core Project Work (CPW)	1	4	4	100
8.	IV	Skill Enhancement Course (SEC)	7	2	14	700
9.		Interdisciplinary Course (IDC)	4	2	8	400
10.		Value Education	1	2	2	100
11.		Health and Wellness	1	1	1	100
12.		Introduction to Disaster Management	1	2	2	100
13.		Summer Internship / Industrial Activity	1	2	2	100
14.		Value Added Course	1	1	1	100
15.		Environmental Studies	1	2	2	100
16.		Gender Studies	1	1	1	100
17.		EXTENSION ACTIVITIES (NCC / NSS / SPORTS / ANTI DRUG CELL / YRC & Any Other Activities	--	1	1	--
Total			49	-	150	4900

\$	For those who have studied Tamil upto 10 th +2 (Regular Stream)															
+	Syllabus for other Languages should be on par with Tamil at degree level															
#	Those who have studied Tamil upto 10 th +2 but opt for other languages in degree level under Part - I should study special Tamil and those who have not studied Tamil in the school level should study Basic Tamil in Part – IV under the Interdisciplinary Course.															
**	Examination at the end of the next semester															
##	Naan Mudhalvan Scheme: As per the Naan Mudhalvan Scheme instructions, 5 courses from 2 nd to 6 th semester should be studied under Skill Enhancement Course.															
\$\$	NCC Course is one of the Choices in the Interdisciplinary Course. Only the NCC Cadets are eligible to choose this course. However, NCC Course is a Compulsory Course for the NCC Cadets.															
@	Health and Wellness: Assessments: • Use self-reflective worksheets to assess their understanding • submit the worksheets to internal audit / external audit • Every student’s activity report should be documented and the same have to be assessed by the Physical Director with Mentor. The evaluation should be for 100 marks. No examination is required. Scheme of Evaluation: <table><tr><th>Part</th><th>Description</th><th>Marks</th></tr><tr><td>A</td><td>Report</td><td>40</td></tr><tr><td>B</td><td>Attendance</td><td>20</td></tr><tr><td>C</td><td>Activities (Observation During Practice)</td><td>40</td></tr><tr><td colspan="2">Total</td><td>100</td></tr></table>	Part	Description	Marks	A	Report	40	B	Attendance	20	C	Activities (Observation During Practice)	40	Total		100
Part	Description	Marks														
A	Report	40														
B	Attendance	20														
C	Activities (Observation During Practice)	40														
Total		100														
@@	Summer Internship / Industrial Activity Internship will be carried out during the summer vacation after the second year. Viva-Voce will be conducted by the college and Marks shall be sent to the University and the same will be included in the 5th semester Mark Statement. Summer Internship / Industrial Activity & Project Work Scheme of Evaluation: <table><tr><th>Description</th><th>Marks</th></tr><tr><td>Report</td><td>80</td></tr><tr><td>Viva-Voce</td><td>20</td></tr><tr><td>Total</td><td>100</td></tr></table>	Description	Marks	Report	80	Viva-Voce	20	Total	100							
Description	Marks															
Report	80															
Viva-Voce	20															
Total	100															
*	Extension Activities shall be outside instruction hours.															

PROGRAMME OUTCOMES:

PO 1	Communication Skill: Mandatory language courses facilitate to become proficient in communication, culturally aware, and more employable in both Indian and global contexts. Improve presentations skill, debates, and professional communication.
PO 2	Disciplinary Knowledge: Learn in-depth complex scientific concepts, demonstrate their ability to explain and apply their knowledge. Consistent in learning by earning extra credits in specialized courses within the science domain and enhance disciplinary knowledge.
PO 3	Critical thinking: Field and academic visits will help students to develop observation skills, grasping ability, collect and interpret data and propose models that will help them to understand hypotheses and conclusions.
PO 4	Analytical Reasoning: Through the interactions, students will develop skills of critical reading of texts, identifying gaps in knowledge, formulating scientific questions, and on will recognizing the synthesis of new ideas.
PO 5	Scientific Reasoning: Skill oriented courses will provide details on principles, conduct of proper calibration and use of scientific instrumentation and appropriate use of scientific techniques in experimental design
PO 6	Self-directed Learning: Preparation of field reports helps them to present their results and discussion in a written format that is typically required for their future professions.
PO 7	Reflective Thinking: All core courses with laboratory components will provide exposure to a wide range of research techniques, therein enhancing their understanding of the application of techniques in their domain.
PO 8	Problem Solving: Students will develop the ability to reason, apply numerical concepts, and equations in their fields of study for interpreting scientific data and drawing relevant scientific conclusions.
PO 9	Research-related Skills: Students undertaking a internship will have the opportunity to design, develop and execute their own research ideas in their experiments, thus expanding their knowledge of research methods and laboratory skills.
PO 10	Lifelong Learning: Ability to understand the gaps in knowledge and skill, adapt to technological change, engage in self-directed learning.

PROGRAMME SPECIFIC OUTCOMES:

PSO 1	To acquire the required knowledge in the Hardware and Software aspects of Computer Science domain and the art of programming.
PSO 2	To understand the development methodologies of software systems and the ability to analyse, design and develop computer applications for real life problems.
PSO 3	To gain knowledge and skills to collaborate and communicate with peers in IT / ITES industries
PSO 4	To understand, adjust and adapt with the dynamic technical environment for the growth of IT industry
PSO 5	To transfer the skills gained, to provide innovative and novel solutions by maintaining ethical norms for the betterment of humane society

Year : First

CORE COURSE - 1
PROGRAMMING IN C AND DATA STRUCTURES
(Theory)

Semester: I

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Identify and Recall the fundamental syntax of C programming while defining the basic concepts of linear and non-linear data structures.
- ❖ Explain and Interpret the logical flow and the operational mechanics of various linear and non-linear data structures.
- ❖ Apply C programming syntax and memory management techniques to implementation of linear and non-linear data structures.
- ❖ Analyze and Differentiate complex programming constructs and data structures to optimize memory and data management.
- ❖ Evaluate and justify the selection of programming constructs, memory management techniques, and data structures.

UNIT – I : INTRODUCTION

Basic of C: History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Order of Precedence, Evaluating of Arithmetic Expressions – Type Conversion- Decision Statements: if, if-else, and nested if statements.

UNIT – II : LOOPING AND FUNCTIONS

Loops Structures: For Loop, While, Do-while loop – Arrays: - One Dimensional Array, Two-dimensional Arrays, Character Arrays and Strings – Functions: Function with arrays - Function with decision and looping statements - Recursion.

UNIT – III : POINTERS AND STRUCTURES

Pointers: Introduction – Pointer Expressions – Chain of Pointers – Pointers and Arrays – Array of Pointers – Pointers as function arguments – Functions returning Pointers – Pointers to Functions – Function pointer – Structures - declaration, initialization, Array of Structures – Pointer to structures, Structures and functions – Typed of Enumerated data types, Unions.

UNIT – IV : STRING AND FILES

Strings Processing, Standard string library functions – Files: introduction and files functions – Writing and reading in Text mode – Simple application: Display the contents of a file. Write data to a file. Append data to an existing file – File IO– Reading and writing structures.

UNIT – V : DATA STRUCTURES

Stack: LIFO concept, Stack operations, Array implementation of stack – Queue: FIFO concept, Queue operations, Array implementation of queue – Singly Linked List: concepts, operations – Doubly Linked List: concepts, operations – Trees: General trees, Binary trees.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS:

1. E. Balagurusamy, “Programming in ANSI C”, Tata McGraw Hill, New Delhi, Ninth Edition, 2024.
2. Reema Thareja, “Data Structure using C, “Oxford University Press”, New Delhi, Third Edition, 2023

REFERENCES:

1. Byron S. Gottfried, “Programming with C”, Schaum’s Outline Series, Tata- McGraw Hill Edition, New Delhi, 1991.
2. E.Horowitz, S.Sahni and Susan Anderson Freed, “Fundamental Data Structures in C”, 2ed, Orient BlackSwan Publisher, 2009
3. E. Karthikeyan, “A Textbook on C Fundamentals, Data Structures and Problem Solving”, Prentice-Hall of India Private Limited, New Delhi, 2008.
4. Yashavant Kanetkar, “Let us C”, BPB Publications, Tenth Edition, New Delhi, 2010.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

CO1	Demonstrate the ability to construct C programs by correctly utilizing basic building blocks
CO2	Design and implement modular software solutions using functions and recursion and arrays
CO3	Apply pointer arithmetic to manage memory addresses and organize complex information using user-defined data types
CO4	Design and implement modular software solutions using functions and recursion
CO5	Analyze and implement core data structure concepts, including the LIFO/FIFO operations of stacks and queues

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	2	3	2	2	3	2	1	3	3	1	3	3	2	2	2	2.3
CO2	3	3	3	2	3	1	2	3	2	3	3	3	2	2	1	2.4
CO3	2	3	2	2	2	3	2	2	3	1	3	3	3	2	2	2.3
CO4	2	2	1	1	3	1	2	1	2	2	3	3	2	2	2	1.9
CO5	3	3	3	3	2	1	3	1	2	3	3	3	3	2	2	2.5
Average	2.4	2.8	2.2	2.0	2.6	1.6	2.0	2.0	2.4	2.0	3.0	3.0	2.4	2.0	1.8	2.4

Mean Co : 2.4

3 - Strong, 2 - Medium , 1- Low

Year : First

CORE PRACTICAL – 1
PROGRAMMING IN C AND DATA STRUCTURES LAB
Practical

Semester: I

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Identify and define core C programming elements and the structural properties of linear data structures like Arrays and Stacks.
- ❖ Demonstrate how to use conditional logic and control structures to solve mathematical logic problems
- ❖ Implement fundamental algorithms for data retrieval and organization, specifically performing Linear Search and Bubble Sort
- ❖ Analyze and compare the operational mechanisms of various data structures,
- ❖ Design and construct modular programs that utilize dynamic memory and pointers to perform complex operations

LIST OF EXERCISES

To develop the C program for the following Exercises

1. Input/Output, Arithmetic, and Conditional Logic:

Concepts: Basic I/O (printf, scanf), operators, expressions, decision-making (if, switch)

Write a C Program to compute grade based on marks

2. Loops and Pattern Printing :

Concepts: for, while, do-while loops, nested loops

Write a C Program to Generate Multiplication Table

3. Arrays and Strings :

Concepts: 1D & 2D arrays, string handling functions

(a) Write a C Program to Find largest and smallest element in an array

(b) Write a C Program to count vowels and consonants

4. Functions and Recursion :

Concepts: User-defined functions, parameter passing, recursion

Write a C Program to Print Fibonacci Series

5. Structures and File I/O :

Concepts: Structures, unions (basic idea), file handling (fopen, fread, fwrite)

Write a C Program Student record management using structures

6. Dynamic Array Implementation :

Concepts: Dynamic memory allocation (malloc, calloc, realloc, free)

Write a C Program Create dynamic array and perform insertion/deletion

7. Singly Linked List Operations :

Concepts: Linked list creation, traversal, insertion, deletion

Write a C Program to Reverse a linked list and count number of nodes

8. Doubly Linked List Operations :

Concepts: Forward and backward traversal, insertion, deletion

Write a C Program to Create and display doubly linked list, Forward and backward traversal, insertion, deletion

9. Searching and Sorting Techniques :

Concepts: Searching (Linear, Binary) and Sorting Techniques (Bubble, Selection, Insertion, Quick, Merge)

(a) Write a C Program to Implement Linear and Binary Search

(b) Write a C Program to Implement Sorting Techniques

10. Tree Traversals :

Concepts: Binary Trees, traversal techniques

Write a C Program to Create a Binary Tree and Counting leaf nodes

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Describe and implement basic control structures to solve mathematical problems
- CO2 Apply iterative and conditional logic to perform data validation tasks, such as determining if a number is a palindrome
- CO3 Demonstrate the ability to store, traverse, and perform aggregate calculations (sum and average) on data sets using arrays
- CO4 Construct and analyze linear data structures by implementing Stack, Queue operations and Singly Linked Lists
- CO5 Analyze and execute fundamental algorithms for data organization and retrieval, specifically implementing Linear Search and Bubble Sort

Year : First

**CORE COURSE - 2
PROGRAMMING IN JAVA
Theory**

Semester: II

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Explain the core features of Java and implement essential programming constructs
- ❖ Apply Object-Oriented Programming (OOP) principles by creating classes and objects
- ❖ Analyze and implement complex relationships using inheritance, interfaces, and polymorphism
- ❖ Build resilient applications by implementing comprehensive exception handling (try-catch, custom exceptions)
- ❖ Design and construct professional-grade desktop applications by integrating AWT/Swing.

UNIT – I : OVERVIEW OF JAVA

Object Oriented Programming, Structure of Java program, Control statements, Data types, variables, and Arrays, Operators. Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference. Introducing Methods, Constructors, this Keyword, finalize() class.

UNIT – II : METHODS AND CLASSES

Overloading Methods, Overloading Constructors, Recursion, Introducing final, Nested and Inner Classes, Using Command Line Arguments, Inheritance: Inheritance Basics, Using Super, Method Overriding, Abstract Classes, The Object Class

UNIT – III : PACKAGES AND INTERFACES

Packages, Access Protection, Importing packages, Interfaces, Exception Handling: Fundamentals, Exception Types, Uncaught Exceptions, try and catch, Multiple catch clauses, Nested try statements, Throw, throws, finally. Multithreaded Programming: Thread model, Creating a Thread, Creating Multiple Threads

UNIT – IV : STRING HANDLING

Special String operations, Character extraction and String Comparison, Modifying a String. The Applet Class: Applet Basics, Applet Architecture, Apple Skeleton, Simple Applet Display Methods, Request Repainting, HTML APPLET tag.

UNIT – V : EVENT HANDLING

Event Handling Mechanisms, Event Classes: Action Event Class, AdjustmentEvent Class, ComponentEvent Class, ContainerEvent Class, FocusEvent Class Introducing the AWT: AWT Class, Window Fundamentals, Working with Graphics, Working with Color

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS :

1. S. Sagayaraj, R. Denis, P. Karthik & D. Gajalakshmi, "Constructive Java Programming", Universities Press, 2021.
2. E. Balagurusamy, "Programming with JAVA", Tata McGraw Hill, New Delhi, 2019.

REFERENCES:

1. Herbert Schildt, Java: The Complete Reference
2. C. Muthu, "Programming with JAVA", Vijay Nicole Imprints Private Limited, Chennai, Second Edition, 2011.
3. Bruce Eckel, Chuck Allison, "Thinking in Java", Prentice Hall Publications, 2006
4. Malina Pronto, "Java: How To Learn Java Programming: How To Improve Your Java Coding In 2020/2021: 5 Programming Languages To Learn For Beginners In Tech", Independently Published, 2020.
5. Nick Samoylov, "Learn Java 12 Programming: A Step-by-step Guide to Learning Essential Concepts in Java", Packt Publishing, 2019.
6. <https://www.javatpoint.com/java-tutorial>
7. <https://www.geeksforgeeks.org>
8. <https://www.javatpoint.com>

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

CO1	Describe the Java runtime environment and implement fundamental programming constructs
CO2	Apply Object-Oriented Programming (OOP) principles to design modular code using classes, objects
CO3	Analyze and manage complex data relationships by implementing multi-dimensional arrays, advanced string handling
CO4	build fail-safe applications by implementing multi-level exception handling and developing multi-threaded programs
CO5	Synthesize full-scale Java applications by integrating interactive GUI components (AWT/Swing) with JDBC

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	1	3	1	3	1	1	2	2	2	2	2	2.1
CO2	3	2	1	2	2	2	1	1	3	1	3	3	3	3	2	2.1
CO3	2	3	2	3	1	2	1	1	1	1	2	2	3	2	1	1.8
CO4	3	3	3	2	2	1	3	2	2	1	2	2	2	2	2	2.1
CO5	3	3	3	3	2	2	2	3	1	2	3	3	1	3	2	2.4
Average	2.8	2.8	2.4	2.4	1.6	2.0	1.6	2.0	1.6	1.2	2.4	2.4	2.2	2.4	1.8	2.4

Mean Co : 2.4

3 - Strong, 2 - Medium , 1- Low

Year : First

CORE PRACTICAL - 2

Semester: II

OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Code :

Practical

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Identify and define the syntax required for basic Java programming,
- ❖ Explain and interpret the logic behind iterative and conditional statements used to solve mathematical problems
- ❖ Apply Java control structures to develop algorithms that manipulate data, specifically for reversing numbers and calculating the sum of digits.
- ❖ Analyze the requirements for graphical user interfaces to implement Applets
- ❖ Design and evaluate responsive Java applications that incorporate animation and event handling

LIST OF EXERCISES

1. Program to check whether a person is eligible to vote or not. If not find how many years he or she has wait to cause their vote.
2. Program to handle **looping and iterative statements**
3. Program to demonstrate **method overloading**.
4. Program to demonstrate **method overriding**
5. Program to handle **Exception Handling**.
6. Program to handle **Multithreading**
7. Program to demonstrate the various **string handling** functions.
8. Program to find area of **triangle and volume of rectangle** using inheritance.
9. Program to implement the concept of **packages**.
10. Program to create **multiple threads** using thread class.
11. JAVA applet to draw **multiple shapes with different colors**.
12. Program to handle a **button click event** and display a message

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- | | |
|-----|---|
| CO1 | Java syntax and control structures to solve fundamental problems |
| CO2 | Construct algorithms to transform and analyze numerical data, specifically by reversing numbers and calculating the sum of digits |
| CO3 | Construct algorithms to transform and analyze numerical data, specifically by reversing numbers and calculating the sum of digits |
| CO4 | Evaluate and implement interactive applet features such as displaying system time, creating moving text animations |
| CO5 | Synthesize event-handling techniques to create responsive programs |

COURSE OBJECTIVES :

This course aims to :

- ❖ Identify core language features including reserved keywords, identifiers, and variables interpret
- ❖ Explain and apply decision-making constructs, nested loops, and various data types.
- ❖ Design modular solutions by defining functions with multiple return values, utilizing recursive logic, and organizing code
- ❖ Analyze and implement Object-Oriented principles such as encapsulation, inheritance, and polymorphism
- ❖ Construct integrated applications that perform sophisticated text processing

UNIT – I: INTRODUCTION TO PYTHON:

Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary – Data type conversion.

UNIT – II : FLOW CONTROL

Decision Making – Loops – Nested Loops – Types of Loops. Functions: Function Definition – Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.

UNIT – III : MODULES AND PACKAGES

Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules. Python Strings: String operations - Immutable Strings - Built-in String Methods and Functions - String Comparison - File Handling- Directories in Python.

UNIT – IV : OBJECT-ORIENTED PROGRAMMING

Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes- Destructors in Python – Encapsulation - Data Hiding – Inheritance - Method Overriding- Polymorphism.

UNIT – V : EXCEPTION HANDLING

Built-in Exceptions-Handling Exceptions- Exception with Arguments - Raising Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags-Regular Expression Patterns- Character Classes-Special Character Classes - Repetition Cases - findall() method - compile() method.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS :

1. Reema Thareja, “ PYTHON Programming”, Oxford University Press, New Delhi, Third Edition, 2025
2. Jeeva Jose and P. Sojan Lal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Book Publishing Co, 2016.

REFERENCES :

1. Mark Summerfield. — Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
2. Martin C. Brown, —PYTHON: The Complete Reference, McGraw- Hill, 2001
3. Wesley J. Chun, “Core Python Programming”, Prentice Hall Publication, 2006.
4. Timothy A Budd, “Exploring Python”, Tata McGraw Hill, New Delhi, 2011
5. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016 Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Describe the core features of Python and utilize fundamental syntax
- CO2 Apply decision-making constructs and various loop types to manipulate collections
- CO3 Design modular applications by implementing recursive functions, custom modules, and hierarchical packages
- CO4 Analyze and implement Object-Oriented principles, including inheritance and polymorphism
- CO5 Synthesize complex programs that perform advanced text processing using regular expressions

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	3	2	1	3	2	3	3	2	2	3	3	2.5
CO2	2	3	2	3	3	3	3	3	2	2	3	3	3	3	2	2.7
CO3	3	2	2	1	3	1	3	3	2	3	3	3	3	3	2	2.3
CO4	3	3	3	2	3	2	2	2	2	2	2	2	3	3	2	2.4
CO5	3	3	3	2	2	1	3	2	1	1	2	3	2	3	1	2.0
Average	2.8	2.8	2.6	2.0	2.8	1.8	2.4	2.6	1.8	2.2	2.6	2.6	2.6	3.0	2.0	2.4

Mean Co : 2.4

3 - Strong, 2 - Medium, 1- Low

Year : Second

CORE PRACTICAL - 3
PROGRAMMING IN PYTHON LAB
Practical

Semester: III

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Identify and define core Python elements, including reserved keywords, identifiers, variables,
- ❖ Explain the mechanics of decision-making statements and iterative loops used to solve computational problems
- ❖ Implement functional programming by creating reusable code blocks and recursive functions
- ❖ Analyze and organize code using Object-Oriented principles—including inheritance and polymorphism.
- ❖ Construct comprehensive applications that integrate file handling for persistent storage with regular expressions

LIST OF EXERCISES

Implement the following concepts using python

1. Basic Syntax & Input/Output
2. Flow Controls & Loops
3. Lists & Iterables
4. Functions and Recursive Functions
5. Build in Modules
6. String Operations
7. Lists, Tuples, & Sets
8. Exception Handling
9. Object-Oriented Programming (OOP) – Inheritance, Polymorphism
10. Basic File I/O & Error Handling
11. Regular expression Modifiers
12. Advanced File & Data Handling (Eg. Directory Tree Generator, JSON Configuration Parser)

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Apply fundamental control structures to solve simple computational problems
- CO2 Construct algorithms to perform mathematical operations, including calculating the sum of natural numbers
- CO3 Analyze text data to perform pattern-based checks, such as identifying palindromes and categorizing characters into vowels or consonants
- CO4 Design and implement recursive functions to solve complex mathematical problems
- CO5 Synthesize file-handling techniques to process external data, specifically calculating metrics

COURSE OBJECTIVES :

This course aims to :

- ❖ Recall the limitations of relational databases and identify the primary types of NoSQL databases
- ❖ Explain the principles of the ER model, including entities, attributes, and relationship sets.
- ❖ Apply SQL commands and aggregate functions to perform complex data queries and set operations.
- ❖ Analyze relational schemas to identify redundancies using functional dependencies and perform decomposition through normal forms
- ❖ Design comprehensive database systems for real-world applications such as E-commerce or Big Data systems

UNIT – I: DATABASE SYSTEMS & ER MODEL

Overview of Database Systems- Managing Data – File System vs DBMS –Structure of DBMS – Schema and Instances.Database Design and ER Model: Entities, Attributes, Entity Sets Relationships and Relationship Sets – ER Diagrams – Extended ER Features.Introduction to NoSQL: Need for NoSQL – Limitations of Relational Databases – Types of NoSQL Databases.

UNIT – II: RELATIONAL MODEL & DESIGN

Relational Model: Structure of Relational Databases – Keys – Integrity Constraints – Relational Algebra – Relational Calculus. ER to Relational Mapping – Views – Schema Design – Materialized Views. Aggregate Models – Column-family concept – Schemaless Databases.

UNIT – III: SQL & TRANSACTION MANAGEMENT

SQL Queries: Basic SQL Queries – INSERT, UPDATE, DELETE – SELECT – Set Operations – Nested Queries – Aggregate Functions – NULL Values- Constraints – Triggers – Views – Active Databases.- ACID Properties – Transactions and Schedules – Lock-based Protocols – Crash Recovery.

UNIT – IV: NORMALIZATION, SECURITY & APPLICATIONS

Schema Refinement and Normal Forms: Functional Dependencies – Normal Forms (1NF, 2NF, 3NF, BCNF) – Decomposition – Normalization in Database Design. Security and Authorization: Database Security – Access Control. Applications: Big Data Systems – E-commerce – Content Management Systems – Real-time Analytics.

UNIT – V: NoSQL DATABASES & DISTRIBUTED CONCEPTS

No SQL Data Models- Key-Value Stores – Document Databases – Column-Family Stores – Graph Databases – Features and Use Cases. Examples of No SQL Systems: Mongo DB, Cassandra

UNIT – VI: CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned..

RECOMMENDED BOOKS :

1. Database System Concepts, Sixth edition, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill-2010.
2. Jagdish Chandra Patni, Hitesh Kumar Sharma, Ravi Tomar, Avita Katal., "Database Management System: An Evolutionary Approach", CRC Press, 2022.

REFERENCES:

1. Abraham Silberschatz, Hendry F. Korth, S Sudharshan," Database System Concepts", 6th Edition, McGraw Hill International, 2019.
2. Blok Dyk, Gerardus, and Blok Dyk, Gerardus, "RDBMS Relational Database Management System a Complete Guide", 2020 Edition, Emereo Pty Limited, 2019.
3. Wilfried Lemahieu, Seppevanden Broucke, Bart Baesens, "Principles of Database Management: The Practical Guide to Storing, Managing and Analyzing Big and Small Data", Cambridge University Press, 2018.
4. C.J. Date, "An Introduction to Database Systems" Addison Wesley, 2000.

e- BOOKS :

1. <https://tutorialspoint.dev/computer-science/dbms>
2. <https://tutorialspoint.dev/computer-science/NoSQL>

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Distinguish between traditional file systems and DBMS structures, while identifying the core necessity and types of NoSQL databases
- CO2 Construct comprehensive Entity-Relationship (ER) diagrams and map them into relational schemas
- CO3 Perform complex data manipulations using SQL queries, set operations, and aggregate functions
- CO4 Analyze and refine database schemas by applying normalization techniques (1NF through BCNF) to eliminate redundancies
- CO5 Design secure, scalable data solutions by integrating NoSQL models (like MongoDB and Cassandra) with distributed concepts

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	2	2	2	2	2	3	3	3	2	2	2	2.4
CO2	2	2	3	3	1	1	2	2	1	1	3	3	3	3	1	2.1
CO3	2	3	3	3	2	3	2	1	2	1	3	3	3	1	3	2.3
CO4	3	3	2	2	2	2	2	3	3	2	3	3	3	2	1	2.4
CO5	2	3	3	3	3	2	1	1	2	2	3	3	3	3	2	2.4
Average	2.4	2.8	2.8	2.6	2.0	2.0	1.8	1.8	2.0	1.8	3.0	3.0	2.8	2.2	1.8	2.3

Mean Co : 2.3

3 - Strong, 2 - Medium , 1- Low

COURSE OBJECTIVES :

This course aims to :

- ❖ Identify and define the foundational components of database management systems,
- ❖ Explain the core principles of data modeling through ER diagrams and interpret the significance of ACID properties
- ❖ Implement practical data solutions by mapping ER models to relational schemas and performing CRUD operations
- ❖ Analyze and refine database structures using normalization (1NF to BCNF) and extract complex insights from datasets
- ❖ Design and construct integrated, secure data-driven applications that utilize views, indexes, and distributed concepts

LIST OF EXERCISES :

1. Create a table STUDENT with the following fields: ID (Primary Key), NAME, AGE, DEPARTMENT
Perform the following operations:
 - a) Insert at least 5 records
 - b) Display all records
 - c) Update age of a student
 - d) Delete a record
 - e) Display students whose age is greater than 18
2. Create two tables EMPLOYEE and DEPARTMENT and perform:
 - a) Insert records
 - b) Apply INNER JOIN
 - c) Use GROUP BY to count employees in each department
 - d) Find maximum salary
 - e) Create a VIEW for employee details
3. Write SQL queries for the following:
 - a) Use aggregate functions (SUM, AVG)
 - b) Write a subquery to find highest value
 - c) Use ORDER BY
 - d) Apply constraints (PRIMARY KEY, UNIQUE)
 - e) Create and drop a table
4. Using MongoDB:
 - a) Create a database and collection
 - b) Insert 5 documents
 - c) Display all documents
 - d) Update a document
 - e) Delete a document

5. Perform the following operations in MongoDB:
 - a) Use query operators (\$gt, \$lt)
 - b) Retrieve specific records
 - c) Perform aggregation using group
 - d) Create index
 - e) Display sorted output
6. Design a simple application using NoSQL:
 - a) Create collection (Product/Student)
 - b) Insert multiple records
 - c) Perform update and delete
 - d) Use aggregation
 - e) Compare with RDBMS (write 3 points)

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- | | |
|-----|--|
| CO1 | Distinguish between file systems and DBMS, identifying the core necessity of NoSQL structures |
| CO2 | Design comprehensive Entity-Relationship (ER) diagrams and implement them as structured SQL tables |
| CO3 | Perform complex data retrieval and modification using SQL (Joins, Subqueries) and NoSQL |
| CO4 | Refine database schemas through normalization (1NF to BCNF) and analyze data distributions using aggregate functions |
| CO5 | Construct integrated data-driven applications that utilize database views, security access controls |

Year : Third

CORE COURSE - 5
SHELL PROGRAMMING
Theory

Semester: V

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ understand the fundamentals of UNIX/Linux operating systems and shell environments.
- ❖ learn shell scripting syntax, variables, operators, and control structures for automating tasks.
- ❖ develop scripts using loops, conditional statements, functions, and arrays for solving real-world problems.
- ❖ apply file handling, process management, and text-processing utilities in shell scripts.
- ❖ design and implement advanced shell programs for system administration and automation tasks.

UNIT – I: INTRODUCTION TO UNIX/LINUX AND SHELL ENVIRONMENT

Overview of UNIX/Linux Operating Systems-Features and Architecture of UNIX/Linux-Linux File System Structure-Basic Linux Commands-User and Group Management-Shell Types and Features-Command-Line Interface-
Environment Variables-Shell Invocation and Initialization Files-Introduction to Shell Scripting

UNIT – II: SHELL SCRIPTING FUNDAMENTALS

Creating and Executing Shell Scripts-Shell Variables and Constants-Command-Line Arguments-Input and Output Operations-Arithmetic Operations-Operators in Shell Programming-Quoting Mechanisms-Reading User Input-Decision-Making Statements-if-if-else-nested if-case statement

UNIT – III: LOOPING AND FUNCTIONS

Iterative Statements -for loop-while loop-until loop-Nested Loops-Loop Control Statements-break-continue-exit-Shell Functions - Function Parameters- Return Values-Recursive Functions-Arrays in Shell Programming

UNIT – IV: FILE HANDLING AND TEXT PROCESSING

File Operations-Create-Read-Write-Append-Delete-File Permissions and Ownership-Redirection and Pipes-Filters and Utilities-grep-sed-awk-sort-cut
Tr-wc-Pattern Matching and Regular Expressions-Process Management Commands

UNIT – V: ADVANCED SHELL PROGRAMMING AND SYSTEM ADMINISTRATION

Shell Script Debugging Techniques-Scheduling Jobs using cron and at
Process Monitoring and Management-Backup and Restore Automation Scripts-Log File Analysis-Menu-Driven Shell Programs-System Administration Scripts-Network Monitoring Scripts-Shell Scripting Best Practices-Real-Time Automation Case Studies.

UNIT – VI: CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned..

RECOMMENDED BOOKS :

1. Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.
2. N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications, 2008, 1st Edition Reference Books

REFERENCES:

1. Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2008.
2. UNIX Programming Environment by Brian W. Kernigan, Rob Pike -Bell Laboratories; PRENTICE-HALL; Whitehall Books- 1984

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Describe the architecture and features of Linux Operating System and distinguish it from other Operating System.
- CO2 Develop Linux utilities to perform File processing, Directory handling, User Management and display system configuration
- CO3 Develop shell scripts using pipes, redirection, filters and Pipes
- CO4 Apply and change the ownership and file permissions using advance Unix
- CO5 Build Regular expressions to perform pattern matching using utilities and implement shell scripts for real time applications.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	2	2	2	2	2	3	3	3	2	2	2	2.4
CO2	2	2	3	3	1	1	2	2	1	1	3	3	3	3	1	2.1
CO3	2	3	3	3	2	3	2	1	2	1	3	3	3	1	3	2.3
CO4	3	3	2	2	2	2	2	3	3	2	3	3	3	2	1	2.4
CO5	2	3	3	3	3	2	1	1	2	2	3	3	3	3	2	2.4
Average	2.4	2.8	2.8	2.6	2.0	2.0	1.8	1.8	2.0	1.8	3.0	3.0	2.8	2.2	1.8	2.3

Mean CO's : 2.3

3 - Strong, 2 - Medium , 1- Low

Year : Third

CORE COURSE - 6
FUNDAMENTALS OF ALGORITHMS
Theory

Semester: V

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Understand algorithm specification, asymptotic notations, and performance analysis techniques for evaluating algorithms.
- ❖ Acquire knowledge of tree and graph data structures and their traversal and path-finding algorithms.
- ❖ Learn fundamental sorting, searching, and heap-based techniques for efficient data processing.
- ❖ Apply greedy strategies to solve optimization problems such as knapsack, job sequencing, and merge patterns.
- ❖ Develop problem-solving skills using backtracking techniques for combinatorial and constraint satisfaction problems

UNIT - I: INTRODUCTION

Introduction – Algorithm Specification, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Performance Measurement, Randomized algorithms.

UNIT - II: TREES

Trees – Binary tree representations – Tree Traversal – Threaded Binary Trees – Binary Tree Representation of Trees – Graphs and Representations – Traversals, Connected Components and Spanning Trees – Shortest Paths and Transitive closure – Activity Networks – Topological Sort and Critical Paths

UNIT - III: SORTING TECHNIQUES

Algorithms – Priority Queues - Heaps – Heap Sort – Merge Sort – Quick Sort – Binary Search – Finding the Maximum and Minimum.

UNIT - IV: GREEDY METHOD

: The General Method – Optimal Storage on Tapes – Knapsack Problem – Job Sequencing with Deadlines – Optimal Merge Patterns.

UNIT - V: BACK TRACKING

Back tracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS :

1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structure", Galgotia Publications, 2008.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms", University Press, 2008

REFERENCES:

1. Seymour Lipschutz, "Data Structures", Tata McGraw Hill, Schaum's Outline Series, 2014.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms
4. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", MIT Press, 2022.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

CO1	Analyze the efficiency of algorithms using time complexity, space complexity, and asymptotic notations.
CO2	Implement tree and graph traversal algorithms and solve shortest path, spanning tree, and network-related problems.
CO3	Apply sorting, searching, and heap operations to design efficient solutions for computational problems.
CO4	Solve optimization problems using greedy algorithms and evaluate their effectiveness.
CO5	Design and implement solutions for complex problems using backtracking techniques such as N-Queens, subset sum, and graph coloring.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	2	3	2	2	1	2	2	1	2	3	2	1	3	1	2.0
CO2	3	3	2	3	2	2	1	2	1	2	3	3	3	3	1	2.3
CO3	3	3	2	2	3	1	2	2	2	3	3	3	3	3	2	2.4
CO4	2	3	3	1	3	2	2	2	1	2	2	2	3	3	3	2.3
CO5	3	3	3	3	1	1	2	3	3	3	3	3	3	2	2	2.5
Average	2.8	2.8	2.6	2.2	2.2	1.4	1.8	2.2	1.6	2.4	2.8	2.6	2.6	2.8	1.8	2.3

Mean CO's : 2.3

3 - Strong, 2 - Medium, 1 - Low

Year : Third

**CORE COURSE – 7
CLOUD COMPUTING
(Theory)**

Semester: V

Code :

Credits: 4

COURSE OBJECTIVES

This course aims to:

- understand the fundamental concepts and types of cloud computing.
- learn cloud computing architecture, virtualization, and cloud technologies.
- study cloud storage systems and cloud-based services.
- analyse security issues and protection mechanisms in cloud environments.
- explore cloud applications and major cloud service providers.

UNIT - I: INTRODUCTION

Introduction to Cloud Computing – Types of Cloud – Evolution of Cloud Computing – Meaning of Cloud Computing – Need for Cloud Computing - Characteristics of Cloud Computing - Benefits of Cloud Computing.

UNIT - II: CLOUD COMPUTING ARCHITECTURE & SERVICE MODELS

Cloud Computing Technology – Cloud Architecture – Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) - Deployment Models: Public Cloud, Private Cloud, Community Cloud and Hybrid Cloud

UNIT - III: DATA STORAGE AND TYPES OF SCALABILITY

Data Storage – Cloud Storage – Cloud Storage from LANs to WANs – Horizontal Scalability, Vertical Scalability - Load Balancing -Designing for Scalability: Scale out, Scale in – Capacity Planning Vs Scalability.

UNIT - IV: CLOUD COMPUTING AND SECURITY

Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services – Cloud Computing Tools: Tools and Technologies for Cloud – Cloud Mashups – Apache Hadoop – Cloud Tools

UNIT - V: CLOUD APPLICATIONS

Moving Applications to the Cloud – Google Cloud Applications – Amazon Cloud Services – Cloud Applications

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for Continuous Internal Assessments Only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS

1. A. Srinivasan and J.Suresh, “Cloud Computing – A Practical Approach for Learning and Implementation”, Pearson India Publications, 2014.
2. Rajkumar Buyya, James Broberg, Andrzej, “Cloud Computing: Principles and Paradigms”, Wiley India Publications, 2011.
3. Kris Jamsa, “Cloud Computing SaaS, Paas, IaaS, Virtualization Business Models, Mobile, Security and more”, Published by Jones & Bartlet Learning, 2012.

REFERENCES:

1. Anthony T.Velte , Toby J. Velte Robert Elsenpeter, “Cloud computing a practical approach”, TATA McGraw- Hill , New Delhi – 2010
2. Michael Miller, “Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online” - Que 2008
3. Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, “Cloud computing for dummies”, Wiley Publishing, Inc, 2010
4. Comer, Douglas, The Cloud Computing Book: The Future of Computing Explained, CRC Press, 2021.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

CO1: explain the fundamentals, types, and working principles of cloud computing.

CO2: describe cloud architecture and cloud computing technologies.

CO3: apply cloud storage and cloud-based services for data management.

CO4: analyse security challenges and protection mechanisms in cloud.

CO5: evaluate cloud applications and services provided by platforms.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean CO
CO1	1	3	1	2	2	1	1	1	0	2	2	1	2	1	2	1.47
CO2	1	3	2	2	2	1	1	2	1	2	3	2	2	2	2	1.87
CO3	1	3	2	3	2	1	1	3	1	2	3	3	2	2	3	2.13
CO4	1	3	3	3	3	1	1	3	2	2	3	2	2	3	2	2.27
CO5	1	3	3	3	2	1	1	3	2	3	3	3	2	3	3	2.40
	1.00	3.00	2.20	2.60	2.20	1.00	1.00	2.40	1.20	2.20	2.80	2.20	2.00	2.20	2.40	2.03

Mean CO's : 2.0

3 - Strong, 2 - Medium , 1- Low

Year : Third

CORE COURSE - 8
SOFTWARE ENGINEERING
Theory

Semester: V

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Understand the fundamental concepts of software engineering and various software process models used in software development life cycle.
- ❖ Analyze and apply requirements engineering techniques for gathering, modeling, and managing software requirements.
- ❖ Learn software design principles, architectural concepts, and object-oriented approaches for developing efficient software systems.
- ❖ Gain knowledge of software coding practices, testing methods, project management, and maintenance activities.
- ❖ Understand web engineering concepts and emerging trends such as cloud computing, service-oriented architecture, and agile development.

UNIT - I: INTRODUCTION:

Introduction: Introduction to Software Engineering - Software Process – Software Process Models - Software Model - Requirements Engineering Principles: Requirements Engineering - Importance of Requirements - Types of Requirements - Steps involved in Requirements Engineering.

UNIT - II: REQUIREMENTS ANALYSIS MODELING:

Analysis Modeling Approaches - Structured Analysis - Object Oriented Analysis - Design and Architectural Engineering : Design Process and Concepts - Basic Issues in Software Design - Characteristics of Good Design - Software Design and Software Engineering - Function Oriented System vs Object Oriented System - Modularity, Cohesion, Coupling, Layering - Real Time Software Design - Design Models - Design Documentation

UNIT - III: USER INTERFACE DESIGN:

Object Oriented Concepts: Fundamental Parts of Object Oriented Approach – Data Hiding and Class Hierarchy Creation - Relationships - Role of UML in OO Design -Design Patterns - Frameworks - Object Oriented Analysis - Object Oriented Design - User Interface Design : Concepts of User Interface - Elements of User Interface -Designing the User Interface - User Interface Evaluation - Golden Rules of User Interface Design - User Interface Models – Usability

UNIT - IV: SOFTWARE CODING:

Introduction to Software Measurement and Metrics – Software Configuration - Project Management Introduction - Introduction to Software Testing - Software Maintenance

UNIT - V: WEB ENGINEERING:

Introduction to Web - General Web Characteristics – Web Application Categories - Working of Web Application - Advantages and Drawbacks of Web Applications - Web Engineering - Emerging Trends in Software Engineering – Web 2.0 - Rapid Delivery - Open Source Software Development - Security Engineering - Service Oriented Software Engineering -

Web Service - Software as a Service – Service Oriented Architecture - Cloud Computing - Aspect Oriented Software Development - Test Driven Development - Social Computing

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS :

1. Chandramouli Subramanian, Saikat Dutt Chandramouli Seetharaman, B.G. Geetha, Software Engineering, Pearson Publications, 2015
2. Software Engineering, Jibitesh Mishra, Pearson Education, 2011

REFERENCES:

1. Ian Sommerville, "Software Engineering", Pearson, 2011.
2. Rod Stephens, "Beginning Software Engineering", Wiley, 2015.
3. Ashfaq Ahmed, Bhanu Prasad, "Foundations of Software Engineering", CRC Press, 2016.
4. Titus Winters, Tom Manshreck, Hyrum Wright, "Software Engineering at Google", O'Reilly Media, 2020

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Explain the principles of software engineering and evaluate different software process models used in the software development life cycle.
- CO2 Apply requirements engineering techniques to elicit, analyze, model, and manage software requirements effectively.
- CO3 Design software systems using appropriate architectural styles, design principles, and object-oriented methodologies.
- CO4 Implement software development best practices, perform software testing activities, and apply project management and maintenance techniques.
- CO5 Analyze and utilize web engineering concepts and modern software development technologies such as cloud computing, service-oriented architecture, and agile methodologies.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	3	2	1	1	2	1	2	3	2	3	2	2.2
CO2	3	3	3	1	1	3	1	2	2	3	3	3	1	2	2	2.0
CO3	3	2	3	3	1	1	3	2	2	3	3	3	3	3	1	2.3
CO4	3	3	2	2	2	2	2	2	1	2	2	3	3	1	2	2.2
CO5	3	3	1	2	2	1	2	2	1	2	3	2	2	3	1	2.0
Average	3.0	2.8	2.4	2.0	1.8	1.8	1.8	1.8	1.6	2.2	2.6	2.8	2.2	2.4	1.6	2.1

Mean CO's : 2.1

3 - Strong, 2 - Medium , 1- Low

Year : Third

**CORE PRACTICAL - 5
SHELL PROGRAMMING LAB
Practical**

Semester: V

Code :

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Introduce students to the Linux/UNIX environment and shell scripting fundamentals.
- ❖ Develop skills in writing shell scripts using variables, operators, and control structures.
- ❖ Enable students to automate system administration and file management tasks using shell scripts.
- ❖ Provide practical experience in handling strings, arrays, functions, and command-line arguments in shell programming.
- ❖ Develop problem-solving skills through the implementation of real-world scripting applications.

LIST OF EXERCISES

1. Basic Linux Commands

- Practice file and directory management commands
- Use commands for viewing and editing files

2. Simple Shell Script : Write a shell script to display:

- Current date and time, Calendar
- Username, Current working directory

3. Looping Constructs: Implement shell scripts using:

- for loop and while loop

4. File Handling Operations: Write shell scripts to:

- Count lines, words, and characters in a file.
- Check whether a file exists.
- Display file permissions.

5. Menu-Driven Program: Develop a menu-driven shell script for:

- File operations
- Directory operations

6. Arrays in Shell Scripts :

Write shell scripts to store, access, and display values in arrays.

7. User-Defined Functions:

Write shell scripts using user-defined functions to perform file operations.

8. User and Group Administration

Write shell scripts to automate user creation, group creation, and user-group assignment.

9. Backup, Restore, and Shutdown Automation

Write shell scripts to schedule automatic backup, restore files, and perform system shutdown.

10. System Usage Report Generation

Write shell scripts to generate reports on:

- Memory usage, Disk usage & Running processes

11. System Performance Monitoring Write shell scripts to display:

- CPU information, System uptime, Active processes & Log information

12. System Log Analysis

Write shell scripts to view, filter, and analyze system log files.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

CO1: Demonstrate proficiency in Linux commands for managing files, directories, and system resources.

CO2: Develop shell scripts using variables, control structures, loops, arrays, and user-defined functions.

CO3: Perform file handling and user administration tasks through shell scripting and Linux utilities.

CO4: Automate routine system administration tasks such as backup, restoration, scheduling, and system shutdown.

CO5: Monitor system performance and Analyze system logs.

Year : Third

CORE COURSE – 9
DATA COMMUNICATION AND NETWORKS

Semester: VI

Code :

Theory

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ Understand the fundamental concepts of data communication, network models, and the OSI and TCP/IP protocol architectures.
- ❖ Learn different transmission techniques, switching methods, and multiplexing techniques used in computer networks.
- ❖ Gain knowledge of data link layer services including error detection, error correction, and reliable data transfer protocols.
- ❖ Analyze network layer concepts such as IP addressing, routing algorithms, and packet forwarding techniques.
- ❖ Understand transport and application layer protocols and their roles in internet communication services.

UNIT - I: INTRODUCTION

Data Communications – Components – Data Flows – Networks – Physical Structures– Network Types–LAN–WAN–Switching–The Internet –Network Models–Principles of Protocol Layering–TCP/IP Protocol Suite– Description of TCP/IP Layers–The OSI Model.

UNIT – II : TRANSMISSION MEDIA

Transmission Impairment - Transmission Modes – Multiplexing –FDM –WDM–TDM– Circuit Switched Networks–Packet Switching–Datagram Networks – Virtual Circuit Networks – Structure of Circuit Switches – Structure of Packet Switches.

UNIT – III : DATA LINK LAYER

Introduction - Error Detection and Correction – Block Coding – Cycle Codes - Checksum – Forward Error Correction – DLC Services – Data Link Layer Protocols–HDLC– CSMA/CD/CA–Controlled Access–Connecting Devices

UNIT – IV : NETWORK LAYER

Network Layer Services–Network Layer Performance–IPv4Addresses– Internet Protocol (IP)– Routing Algorithms–Least Cost Routing- Distance Vector Routing – Link State Routing – Path-Vector Routing.

UNIT – V : TRANSPORT LAYER

Introduction – Transport Layer Protocols – User Datagram Protocol– TransmissionControlProtocol–ApplicationLayer:-WorldWideWeb and HTTP–File Transfer Protocol–E-Mail–TELNET–Domain Name System.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS:

1. Behrouz A. Forouzan, “Data Communications and Networking”, McGraw-Hill, 5th edition, 2013
2. Andrew S Tanenbaum, Computer Networks, Pearson Education India, Sixth Edition, 2021.

REFERENCES:

1. William Stallings, Data and Computer Communication, Pearson Education India, Eighth Edition, 2007
2. <https://elcomhu.com/Subjects/Computer/Compulsory/Communication/Data-Communications-and-Network-5e.pdf>
3. <https://nptel.ac.in/courses/106105183>
4. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Explain the fundamental concepts of data communication, network models, and the OSI and TCP/IP reference architectures.
- CO2 Apply transmission techniques, switching methods, and multiplexing concepts in the design of computer networks.
- CO3 Analyze data link layer services including error detection, error correction, and reliable data transfer mechanisms.
- CO4 Evaluate network layer functionalities such as IP addressing, routing algorithms, and packet forwarding techniques.
- CO5 Illustrate transport and application layer protocols and their role in enabling internet-based communication services.

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	1	2	2	3	3	2	3	3	2	3	1	2.3
CO2	3	2	3	2	3	2	2	1	2	1	3	3	2	3	2	2.1
CO3	3	3	2	1	2	2	3	2	2	3	3	2	2	2	1	2.2
CO4	3	3	2	2	3	3	1	2	1	1	3	3	3	1	2	2.2
CO5	2	2	2	2	2	2	2	1	1	3	3	3	3	3	1	2.1
Average	2.8	2.6	2.4	1.8	2.2	2.2	2.0	1.8	1.8	2.0	3.0	2.8	2.4	2.4	1.4	2.2

Mean CO's : 2.2

3 - Strong, 2 - Medium , 1- Low

Year : Third

**CORE COURSE - 10
MULTIMEDIA SYSTEMS**

Semester: VI

Code :

Theory

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ understand the fundamentals of UNIX/Linux operating systems and shell environments.
- ❖ learn shell scripting syntax, variables, operators, and control structures for automating tasks.
- ❖ develop scripts using loops, conditional statements, functions, and arrays for solving real-world problems.
- ❖ apply file handling, process management, and text-processing utilities in shell scripts.
- ❖ design and implement advanced shell programs for system administration and automation tasks.

UNIT - I: INTRODUCTION

Multimedia Definition - Uses of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text - Font Editing and Design Tools - Hypermedia and Hypertext.

UNIT - II: MULTIMEDIA TOOLS-AUDIO-VIDEO

Images: Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. Sound: The Power of Sound - Digital Audio - Midi Audio - Midi vs. Digital Audio - Multimedia System Sounds - Audio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.

UNIT - III: ANIMATION IN MULTIMEDIA

Animation: The Power of Motion - Principles of Animation - Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video.

UNIT - IV: MAKING MULTIMEDIA

Making Multimedia: The Stage of Multimedia Project - The Intangible Needs - The Hardware Needs - The Software Needs - An Authoring System's Needs- Multimedia Production Team.

UNIT - V: MULTIMEDIA AND CONTENT CREATION

Planning and Costing: The Process of Making Multimedia - Scheduling - Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content - Ownership of Content Created for Project - Acquiring Talent.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned..

RECOMMENDED BOOKS :

1. Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw-Hill, 2001.
2. Atul Puri, Tsuhan Chen, Multimedia Systems, Standards, and Networks, Taylor & Francis, 2000.

REFERENCES:

1. Rahman, Syed Mahbubur, Interactive Multimedia Systems, IRM Press, 2002.
2. Medioni, Gerard, and Havaladar, Parag. Multimedia Systems: Algorithms, Standards, and Industry Practices, Cengage Learning, 2009.
3. Borko Furht, Multimedia Systems and Techniques, Springer US, 2012.
4. Nahrstedt, Klara, and Steinmetz, Ralf, Multimedia Systems, Springer Berlin Heidelberg, 2013.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Describe the architecture and features of Linux Operating System and distinguish it from other Operating System.
- CO2 Develop Linux utilities to perform File processing, Directory handling, User Management and display system configuration
- CO3 Develop shell scripts using pipes, redirection, filters and Pipes
- CO4 Apply and change the ownership and file permissions using advance Unix
- CO5 Build Regular expressions to perform pattern matching using utilities and implement shell scripts for real time applications.

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	3	2	2	2	2	2	2	3	3	3	2	2	2	2.4
CO2	2	2	3	3	1	1	2	2	1	1	3	3	3	3	1	2.1
CO3	2	3	3	3	2	3	2	1	2	1	3	3	3	1	3	2.3
CO4	3	3	2	2	2	2	2	3	3	2	3	3	3	2	1	2.4
CO5	2	3	3	3	3	2	1	1	2	2	3	3	3	3	2	2.4
Average	2.4	2.8	2.8	2.6	2.0	2.0	1.8	1.8	2.0	1.8	3.0	3.0	2.8	2.2	1.8	2.3

Mean CO's : 2.3

3 - Strong, 2 - Medium , 1- Low

Year : Third

CORE COURSE – 11

Semester: VI

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Code :

Theory

Credits: 4

COURSE OBJECTIVES :

This course aims to :

- ❖ introduce the fundamental concepts of Artificial Intelligence and intelligent systems
- ❖ provide knowledge of search techniques and knowledge representation methods used in AI
- ❖ develop understanding of machine learning algorithms and their applications
- ❖ familiarize students with data science concepts including data collection, pre-processing, and analysis
- ❖ enable students to apply data visualization and analytical tools for effective decision-making

UNIT I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Definition of Artificial Intelligence - history and evolution - AI vs Machine Learning, types of AI (Weak and Strong AI) - intelligent agents and environments -problem-solving using AI - applications of AI in various domains.

UNIT II: SEARCH TECHNIQUES AND KNOWLEDGE REPRESENTATION

Uninformed search strategies (Breadth First Search, Depth First Search) - informed search strategies (A* algorithm, heuristic search) - game playing - constraint satisfaction problems - knowledge representation using logic - semantic networks and frames.

UNIT III: MACHINE LEARNING FUNDAMENTALS

Introduction to Machine Learning, types of learning (supervised, unsupervised, reinforcement learning), classification and regression techniques, clustering (K-means), basics of neural networks, model evaluation methods.

UNIT – IV: INTRODUCTION TO DATA SCIENCE

Overview of data science and data analytics - Data types and sources - Data collection, pre-processing, cleaning, and transformation - Introduction to statistics and exploratory data analysis.

UNIT – V: DATA ANALYSIS AND VISUALIZATION

Data analysis techniques and tools - Data visualization using charts and graphs - Introduction to Python libraries for data science - Basics of predictive analytics and interpretation of results for decision - making.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2020.

- Sam Lau and Joseph Gonzalez, Learning Data Science: Data Wrangling, Exploration, Visualization, and Modeling, O'Reilly Media, 2023

REFERENCES :

- Patrick Henry Winston, Artificial Intelligence, Addison-Wesley, 3rd Edition.
- Crina Grosan and Ajith Abraham, Intelligent Systems: A Modern Approach, Springer.
- Joel Grus, Data Science from Scratch, O'Reilly Media.
- John D. Kelleher and Brendan Tierney, Data Science, MIT Press.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Understand the fundamental concepts of Artificial Intelligence, intelligent agents, and problem-solving techniques
- CO2 Apply search algorithms and knowledge representation methods to solve AI problems
- CO3 Analyse and implement basic machine learning algorithms for classification, regression, and clustering tasks.
- CO4 Understand data science concepts including data collection, preprocessing, and exploratory data analysis
- CO5 Apply data analysis and visualization techniques using appropriate tools for effective decision-making

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	2	2	3	3	2	3	2	1	1	2	3	3	3	2	2.3
CO2	3	2	3	2	1	1	2	1	2	2	3	3	3	3	2	2.1
CO3	3	3	2	3	1	1	1	1	2	3	3	2	3	3	2	2.1
CO4	3	3	3	3	3	3	2	2	2	2	3	3	2	2	1	2.3
CO5	3	3	2	2	1	3	2	2	1	1	2	3	2	3	2	2.1
Average	3.0	2.6	2.4	2.6	1.8	2.0	2.0	1.6	1.6	1.8	2.6	2.8	2.6	2.8	1.8	2.2

Mean CO's : 2.2

3 - Strong, 2 - Medium, 1- Low

Year : Third

**CORE PROJECT WORK
PROJECT WORK**

Semester: VI

Code :

Credits: 4

The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University

Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT/EVALUATION/VIVA VOCE:

PROJECT REPORT EVALUATION (Both Internal & External)

I.	Plan of the Project	20 marks
	Execution of the Plan/collection of Data / Organisation of Materials/ Hypothesis, Testing etc. and presentation of the report	45 marks
	Individual initiative	15 marks
II.	Viva-Voce / Internal & External	20 marks
III.	TOTAL	100 Marks

PASSING MINIMUM:

Project	Vivo-Voce 20 Marks	Dissertation 80 Marks
	40% out of 20 Marks	40% out of 80 marks
	(i.e. 8 Marks)	(i.e. 32 marks)

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate

SKILL ENHANCEMENT COURSE - I
COMPUTER GRAPHICS

Code :

(Theory)

Credits: 2

COURSE OBJECTIVES :

This course aims to :

- ❖ Introduce the basic concepts and components of Computer Graphics systems.
- ❖ Understand various input and output devices used in graphics applications.
- ❖ Learn algorithms for drawing graphical objects and applying their attributes.
- ❖ Develop knowledge of 2D geometric transformations and clipping techniques.
- ❖ Understand graphical user interfaces (GUI) fundamental concepts.

UNIT I: INTRODUCTION TO COMPUTER GRAPHICS

Introduction to Computer Graphics – Video Display Devices – Raster Scan Systems – Random Scan Systems – Graphics Monitors and Workstations – Graphics Software.

UNIT II: INPUT PRIMITIVES

Input Devices – Hardcopy Devices – User Dialogue – Input of Graphical Data – Input Functions – Interactive Picture Construction Techniques.

UNIT III: OUTPUT PRIMITIVES

Output Primitives – Line Drawing Algorithms – Loading the Frame Buffer – Line Function – Circle Generating Algorithms – Line Attributes – Curve Attributes – Colour and Grayscale Levels – Area Fill Attributes – Character Attributes – Bundled Attributes – Inquiry Functions.

UNIT – IV: 2D GEOMETRIC TRANSFORMATIONS

Basic Transformations – Matrix Representations – Composite Transformations – Window to Viewport Coordinate Transformations – Point Clipping – Line Clipping – Cohen-Sutherland Line Clipping — Curve Clipping – Text Clipping.

UNIT – V: GRAPHICAL USER INTERFACES

Graphical User Interfaces and Interactive Input Methods: The User Dialogue – Input of Graphical Data – Input Functions – Interactive Picture Construction Techniques.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

RECOMMENDED BOOKS:

1. Donald Hearn M. Pauline Baker, Computer Graphics C Version, Pearson Education, 2014.
2. Alexey Boreskov, Evgeniy Shikin, "Computer Graphics From Pixels to Programmable Graphics Hardware", CRC Press, 2013.

REFERENCES:

1. Donald Hearn M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2014.
2. Branislav Sobota, "Computer Graphics and Imaging", Intech Open Publication, 2019.
3. Dr. Deepali A. Godse, Atul P. Godse, "Computer Graphics", UNICORN Publishing Group, 2020.
4. Gabriel Gambetta, "Computer Graphics from Scratch A Programmer's Introduction to 3D Rendering", No Starch Press, 2021.
5. <https://archive.org/details/computer-graphics-c-version-hearn-baker>.
6. <https://gabrielgambetta.com/computer-graphics-from-scratch/>

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Explain the fundamentals of computer graphics systems and display technologies.
- CO2 Identify and use different input and output devices in graphics applications.
- CO3 Apply line, circle, and other output primitive generation algorithms.
- CO4 Perform 2D geometric transformations and clipping operations on graphical objects.
- CO5 Design simple graphical applications using GUI concepts.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean Cos
CO1	3	3	3	3	3	2	1	2	1	2	3	2	3	3	1	2.3
CO2	3	3	2	2	3	3	3	3	2	2	3	3	3	2	2	2.6
CO3	3	3	3	3	3	3	1	3	1	1	2	3	3	3	1	2.4
CO4	2	2	2	2	2	3	1	3	2	1	2	3	1	2	2	2.0
CO5	2	3	3	3	3	2	2	3	2	1	2	2	3	3	1	2.3
Average	2.6	2.8	2.6	2.6	2.8	2.6	1.6	2.8	1.6	1.4	2.4	2.6	2.6	2.6	1.4	2.3

Mean CO's : 2.3

3 - Strong, 2 - Medium, 1- Low

SKILL ENHANCEMENT COURSE - II
BIG DATA ANALYTICS
(Theory)

Code :

Credits: 2

COURSE OBJECTIVES :

This course aims to:

- ❖ Explain the concepts and applications of Big Data.
- ❖ Describe Big Data technologies and business applications.
- ❖ Apply data collection, storage, and management techniques
- ❖ Use Hadoop & distributed processing frameworks for Big Data
- ❖ Analyse data using machine learning, and visualization tools

UNIT I: INTRODUCTION

Concepts and Terminology – Big Data Characteristics – Different Types of Data –case study

UNIT II: BIG DATA ADOPTION AND PLANNING CONSIDERATIONS

Data Identification – Data Acquisition and Filtering – Data Extraction – Data validation and cleansing – Data Aggregation and Representation

UNIT III: ENTERPRISE TECHNOLOGIES AND BIG DATA BUSINESS INTELLIGENCE:

Online Transaction and Processing (OLTP) – Online Analytical Processing (OLAP) – Extract Transform Load (ETL) – Data Warehouses – Data Marts.

UNIT – IV: BIG DATA PROCESSING CONCEPTS

Distributed Data Processing – Hadoop – Processing Workloads – Cluster – Processing in Batch Mode – Map – Combine – Partition – Shuffle and Sort.

UNIT – V: BIG DATA STORAGE TECHNOLOGY

On-Disk Storage Devices – NoSQL Database – In- Memory Storage Device

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS:

1. Paul Buhler, Wajid Khattak and Thomas Erl, “Big Data Fundamentals: Concepts, Drivers & Techniques”, Prentice Hall Publications, 1st Edition, January 2016.
2. Dr. A.V.K. Shanthi, Dr. Praveen Kumar Misra, Dr. Bramah Hazela, Dr. Saptarshi Gupta, published a book “Big Data Analytics- Discovering, Analysing, Visualizing and Presenting Data”, by Scientific International Publishing House.

REFERENCES

1. DT Editorial Services, “Big Data (Hadoop 2, Map Reduce, Hive, YARN, Pig, R and Data Visualization) Black Book”, 1st Edition, Dreamtech Press, 2016.
2. Soumendra Mohanty, Madhu Jagadeesh, and Harsha Srivatsa, “Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics”, Apress Media, 2013.
3. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’Reilly Media, 2012
4. <https://hadoop.apache.org/docs/r1.2.1/hadoop-project-dist/hadoop-common/GettingStarted.html>.
5. <https://www.pdfdrive.com/big-data-fundamentals-e187420663.html>.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Recall the basics of Big Data and its applications
- CO2 Know about OLTP, OLAP and ETL
- CO3 Apply the cutting-edge tools and technologies to analyse Big Data
- CO4 Analyse various big data tools and techniques
- CO5 Evaluate various storage and analytical techniques

Mapping with Programme Outcomes and Programme Specific Outcomes

3 - Strong, 2 - Medium, 1- Low

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	2	2	2	1	1	1	2	1	1	3	2	2	2	1	1.73
CO2	3	3	2	2	2	1	1	2	1	2	3	2	2	2	1	1.93
CO3	3	3	3	3	2	1	1	2	1	2	3	3	2	3	1	2.20
CO4	3	3	3	3	2	1	1	3	2	2	3	3	2	3	2	2.40
CO5	3	3	3	3	2	1	1	3	2	2	3	3	3	3	2	2.47
Average	3.00	2.80	2.60	2.60	1.80	1.00	1.00	2.40	1.40	1.80	3.00	2.60	2.20	2.60	1.40	2.15

Mean CO's :2.15

3 - Strong, 2 - Medium, 1- Low

SKILL ENHANCEMENT COURSE - III
MOBILE APPLICATION DEVELOPMENT
(Theory)

Code :

Credits: 2

COURSE OBJECTIVES :

This course aims to :

- ❖ Gain a comprehensive understanding of the basic concepts of mobile app using Android Platform
- ❖ Learn the detail framework of Android Platform
- ❖ Acquire the knowledge on the design aspects in Creating intuitive, reliable mobile apps using the android services and components
- ❖ Explore the various additional features of mobile app development
- ❖ Impart skills on Graphical features to design attractive web apps

UNIT I: ANDROID PLATFORM

Introducing the Android Software Development Platform: Understanding Java SE and the Dalvik Virtual Machine-The Directory Structure of an Android Project-Common Default Resources Folders-The Values Folder- Leveraging Android XML- Screen Sizes-Desktop Clocks- Using Android Application Resources-Launching Application: The Android Manifest.xml File - Creating Your First Android Application

UNIT II: ANDROID FRAMEWORK

Android Framework Overview: The Foundation of OOP: The Object-The Blue print for an Object: The Class-Providing Structure for Classes: Inheritance-Defining an Interface Bundling Classes-An overview of XML- The APK File-Android Application Components Android Activities- Android Services - Broad cast Receivers - Content Providers - Android Manifest XML.

UNIT III: WORKING WITH SCREEN LAYOUTS

Screen Layout Design- Android View Hierarchies - Nesting Views-Defining Screen Layouts - Editing the main.xml File-Using Relative Layouts- Sliding Drawers-Using Padding and Margins with Views and Layouts.

UNIT IV: WORKING WITH BUTTONS, MENUS, AND DIALOGS

UI Design: Buttons, Menus, and Dialogs: Using Common UI Elements- Adding an Image Button to Your Layout-Defining Multistate Image Button - Replacing the Default Background- Adding a Text to Your Layout- Adding an Image-Using Menus in Android-Creating the Menu Structure with XML- Running the Application in the Android Emulator

UNIT V: GRAPHICS IN ANDROID

An Introduction to Graphics Resources in Android: Introducing the Drawables- Implementing Images - Creating Animation in Android- Tween Animation in Android-Using Transitions

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS:

1. Jackson W, “Android Apps for Absolute Beginners”, 1st Edition, Apress.
2. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2011.

REFERENCES:

1. [Barry Burd](#) and [John Paul Mueller](#), Android Application Development All-in-One For Dummies, 3rd Edition, 2020.
2. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2011.
3. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt,Ltd,2010
4. Mark L Murphy, “Beginning Android3”, Apress Publications, 2011.
5. <https://www.javatpoint.com/android-tutorial>
6. <https://developer.android.com/develop.com/dos>

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Identify various concepts of mobile application programming in Android platform
- CO2 Implement the business logic in an app with java
- CO3 Understand Android User Interface Design with XML
- CO4 Know about Common Android APIs
- CO5 Deploy applications to the Android marketplace for distribution

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	2	2	3	2	3	2	1	3	2	1	2	2	3	2	2	2.2
CO2	3	3	2	2	3	2	1	1	1	2	3	2	2	2	2	2.1
CO3	3	3	1	2	3	3	1	2	2	3	3	3	1	3	1	2.3
CO4	3	3	3	3	3	2	2	2	2	1	3	2	3	3	2	2.5
CO5	3	3	3	3	2	1	1	2	3	1	3	2	3	3	2	2.3
Average	2.8	2.8	2.4	2.4	2.8	2.0	1.2	2.0	2.0	1.6	2.8	2.2	2.4	2.6	1.8	2.3

Mean CO's : 2.3

3 - Strong, 2 - Medium , 1- Low

SKILL ENHANCEMENT COURSE - IV
DATA MINING
(Theory)

Code :

Credits: 2

COURSE OBJECTIVES :

This course aims to :

- ❖ Understand the basic concepts and architecture of cloud computing
- ❖ Learn various cloud service and deployment models
- ❖ Understand virtualization and cloud infrastructure.
- ❖ Gain knowledge of cloud security and challenges
- ❖ Apply cloud computing concepts in real-world applications.

UNIT I: INTRODUCTION TO DATA MINING

Introduction to Data Mining – Data Mining Concepts – Knowledge Discovery in Databases (KDD) – Data Mining Tasks – Applications of Data Mining – Data Mining Architecture – Challenges in Data Mining.

UNIT II: DATA PREPROCESSING

Introduction to Data Preprocessing – Data Cleaning – Handling Missing Values – Data Integration – Data Transformation – Data Normalization – Data Reduction – Sampling Techniques.

UNIT III: CLASSIFICATION AND PREDICTION

Introduction to Classification – Classification Process – Training and Testing Data – Decision Trees – Information Gain – Naïve Bayes Classifier – Prediction Techniques – Model Evaluation.

UNIT IV: CLUSTERING TECHNIQUES

Introduction to Clustering – Types of Clustering – Similarity Measures – Partitioning Methods – Hierarchical Clustering – Density-Based Clustering – K-Means Algorithm – Cluster Evaluation.

UNIT V: ASSOCIATION RULE MINING

Introduction to Association Rules – Frequent Itemsets – Support and Confidence Measures – Market Basket Analysis – Apriori Algorithm – Rule Generation – Applications of Association Rule Mining.

RECOMMENDED BOOKS:

1. ‘Data Mining: Practical Machine Learning Tools and Techniques’ – Ian H. Witten, Eibe Frank, Mark A. Hall (2016, 4th Edition)
2. ‘The Elements of Statistical Learning’ – Trevor Hastie, Robert Tibshirani, Jerome Friedman (2009, 2nd Edition)

REFERENCES:

1. 'Mining of Massive Datasets' – Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman (2020, 3rd Edition)
2. [IBM Data Science & Data Mining Resources](#)
3. [GeeksforGeeks – Data Mining Tutorial](#)

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Understand concepts of data mining and KDD process
- CO2 Apply preprocessing techniques for data analysis.
- CO3 Implement classification and prediction models.
- CO4 Use clustering techniques to analyze data patterns.
- CO5 Analyze association rules for decision-making applications.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	1	3	3	2	3	2	2	1	3	3	2	3	2	2.4
CO2	3	3	2	2	2	3	3	1	3	3	2	3	3	3	2	2.5
CO3	3	3	3	3	3	2	3	2	1	1	3	2	3	2	2	2.4
CO4	2	2	3	2	1	3	2	2	2	2	3	3	3	3	3	2.4
CO5	3	3	2	1	3	2	2	2	3	3	2	2	2	2	3	2.3
Average	2.8	2.8	2.2	2.2	2.4	2.4	2.6	1.8	2.2	2.0	2.6	2.6	2.6	2.6	2.4	2.4

Mean CO's:2.4

3 - Strong, 2 - Medium , 1- Low

SKILL ENHANCEMENT COURSE - V
INTERNET OF THINGS
(Theory)

Code :

Credits: 2

COURSE OBJECTIVES :

This course aims to:

- ❖ Understand the fundamental concepts, architecture, technologies, and applications of the Internet of Things (IoT).
- ❖ Analyse IoT communication models, M2M systems, network management protocols, and enabling technologies.
- ❖ Apply IoT design methodologies to develop domain-specific IoT solutions.
- ❖ Develop IoT applications using Python programming and Raspberry Pi-based embedded systems.
- ❖ Explore cloud computing platforms and web services for IoT data storage, processing, and application deployment.

UNIT - I: INTRODUCTION

Definition & characteristics of IoT - physical design of IoT - logical design of IoT - IoT enabling Technologies - IoT levels & Deployment templates.

UNIT - II: DOMAIN SPECIFIC IOT

Home Automation - cities - Environment - Energy - retail - logistics - Agriculture - Industry Health and life style.

UNIT – III: IoT and M2M

Deference between IoT and M2M - SDN and NFV for lot - IoT systems management - SNMP - YANG – NETOPEER.

UNIT-III: IoT SPECIFICATION

IoT platforms design Methodology - Domain model specification - Information model specification - IoT level specification - functional view specification - Application Development.

UNIT-IV: LOGICAL DESIGN USING PYTHON

Logical design using python - IoT physical devices and Endpoints, building blocks of IoT device- Raspberry Pi-Linux on Raspberry Pi - Raspberry Pi interfaces.

UNIT-V: IoT AND CLOUD COMPUTING

IoT physical servers & cloud computing-WAMP-Xively cloud for IoT- python Web application framework-Amazon web services for IoT.

RECOMMENDED BOOKS:

1. Bahga, A., & Madiseti, V. K. (2015). Internet of things: A hands-on approach. Universities Press.
2. Srinivasa, K. G., Siddesh, G. M., & Raju, R. H. (2018). Internet of things. Cengage Learning India.

REFERENCES:

1. “Internet of Things: A Hands-On Approach” by Arshdeep Bahga and Vijay Madiseti
2. “Internet of Things: Principles and Paradigms” by Rajkumar Buyya and Amir Vahid Dastjerdi
3. “The Internet of Things: Enabling Technologies, Platforms, and Use Cases” by Pethuru Raj and Anupama C. Raman
4. <https://dotnet.microsoft.com/en-us/learn/iot>
5. <https://docs.aws.amazon.com/iot/latest/developerguide/iot-tutorials.html>
6. <https://techvidvan.com/tutorials/learn-iot/>

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Explain the basic concepts, characteristics, and architecture of IoT.
- CO2 Identify IoT applications in various domains such as smart homes, cities, agriculture, and healthcare.
- CO3 Describe IoT communication, management concepts, and related protocols.
- CO4 Apply IoT design methodologies and specifications to develop IoT solutions.
- CO5 Develop simple IoT applications using Python, Raspberry Pi, and cloud platforms

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	2	2	2	1	1	2	1	2	3	2	2	2	1	1.9
CO2	3	3	2	2	2	1	1	3	2	2	3	2	2	3	2	2.2
CO3	3	3	3	2	2	1	1	2	2	2	3	3	2	2	2	2.2
CO4	3	3	3	3	2	1	1	3	2	2	3	3	2	3	2	2.4
CO5	3	3	2	3	2	2	1	3	2	2	3	3	3	3	2	2.5
Average	3.0	3.0	2.4	2.4	2.0	1.2	1.0	2.6	1.8	2.0	3.0	2.6	2.2	2.6	1.8	2.3

Mean CO's : 2.3

3 - Strong, 2 - Medium , 1- Low

**SKILL ENHANCEMENT COURSE - VI
CYBER SECURITY**

Code :

(Theory)

Credits: 2

COURSE OBJECTIVES

This course aims to:

- Understand the fundamental concepts of cybersecurity.
- Learn common cyber-attacks and security vulnerabilities.
- Gain knowledge of network and Internet security practices.
- Understand cyber laws, ethics, and digital safety measures.
- Develop awareness of cybersecurity tools and protection systems.

UNIT – I: INTRODUCTION TO CYBER SECURITY

Introduction to Cyber Security – Need for Cyber Security – Cyber Space – Cyber Threats – Cyber Crimes – Types of Cyber Attacks.

UNIT – II: CYBER ATTACKS AND MALWARE

Phishing – Spoofing – Social Engineering – Malware – Viruses – Worms – Trojans – Ransomware – Spyware.

UNIT – III: NETWORK AND INTERNET SECURITY

Network Security Basics – Firewalls – Intrusion Detection Systems – Password Security – Secure Browsing – Email Security.

UNIT – IV: DATA SECURITY AND PRIVACY

Data Protection – Data Encryption – Authentication and Authorization – Privacy Issues – Safe Use of social media.

UNIT – V: CYBER ETHICS AND CYBER LAWS

Cyber Ethics – Digital Footprints – Cyber Laws – Information Technology Act – Cyber Safety Best Practices.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for Continuous Internal Assessments Only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS:

1. Stallings, W., & Brown, L. (2024). *Computer security: Principles and practice* (5th ed.). Pearson.
2. Whitman, M. E., & Mattord, H. J. (2024). *Principles of information security* (8th ed.). Cengage Learning.

REFERENCES:

1. Easttom, C. (2022). *Computer security fundamentals* (5th ed.). Pearson.
2. Vacca, J. R. (2021). *Computer and information security handbook* (3rd ed.). Elsevier.
3. Hadnagy, C. (2021). *Social engineering: The science of human hacking* (2nd ed.). Wiley.
4. Brooks, C. J., Grow, C., Craig, P., & Short, D. (2022). *Cybersecurity essentials*. Wiley.

COURSE OUTCOMES:

Upon successful completion of this course, students would be able to:

CO1: Explain the basic concepts of cybersecurity, threats, and cyber-crimes.

CO2: Identify common cyber-attacks affecting information systems.

CO3: Apply security measures to protect networks and systems.

CO4: Demonstrate awareness of data security, and safe Internet practices.

CO5: Explain cyber ethics, cyber laws, and best practices for responsible digital citizenship.

Mapping with Programme Outcomes and Programme Specific Outcomes
3 - Strong, 2 - Medium, 1 – Low

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	2	2	2	2	1	1	2	1	2	3	2	2	2	1	1.87
CO2	3	3	2	2	2	1	1	2	1	2	3	3	2	2	1	2.00
CO3	3	3	3	3	2	1	1	2	2	2	3	3	2	3	1	2.27
CO4	3	3	2	3	3	1	1	2	2	2	3	3	2	3	2	2.33
CO5	2	3	2	2	3	2	2	2	2	3	2	2	2	2	3	2.27
Average	2.80	2.80	2.20	2.40	2.40	1.20	1.20	2.00	1.60	2.20	2.80	2.60	2.00	2.40	1.60	2.15

Mean CO's: 2.15

3 - Strong, 2 - Medium , 1- Low

**SKILL ENHANCEMENT COURSE - VII
VIRTUAL REALITY AND AUGMENTED
REALITY
(Theory)**

Code :

Credits: 2

COURSE OBJECTIVES

This course aims to:

- To understand the basic concepts and evolution of Virtual Reality (VR) and Augmented Reality (AR).
- To identify the hardware and software components used in VR and AR systems.
- To understand the design and development aspects of VR and AR applications.
- To explore the current trends and future scope of immersive technologies.
- To examine the applications of VR and AR in various domains.

UNIT I: INTRODUCTION TO VR AND AR

Definition and concepts of Virtual Reality and Augmented Reality – Types of VR and AR – History and evolution – Technology hype cycle.

UNIT II: VR AND AR TECHNOLOGIES

VR and AR hardware – Head-mounted displays and controllers – Features and functionalities – Current challenges and adoption trends.

UNIT III: DESIGN AND DEVELOPMENT OF VR AND AR

Consumer-grade VR and AR systems – Design principles for immersive environments – Planning and development of VR/AR applications.

UNIT IV: FUTURE OF VR AND AR

Emerging trends in VR and AR – Social experiences in virtual environments – Future opportunities and challenges.

UNIT V: APPLICATIONS OF VR AND AR

Applications in Education, Entertainment, Tourism, Retail, Healthcare, Real Estate, and Marketing – Mobile AR applications such as Google Translate, Amazon AR View.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for Continuous Internal Assessments Only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS

1. Jonathan Linowes, Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, ARCore, ARKit, and Vuforia, 2nd Edition, Packt Publishing, 2023.
2. Tony Parisi, Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, 2nd Edition, O'Reilly Media, 2024.

REFERENCES

1. Steve Aukstakalnis, Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Addison-Wesley Professional, 2022.
2. Paul Mealy, "Virtual & Augmented Reality For Dummies" Published by: John Wiley & Sons, Inc., John Wiley & Sons, Inc., 2018.

COURSE OUTCOMES:

Upon successful completion of this course, students would be able to:

CO1: Explain the fundamentals and evolution of VR and AR.

CO2: Identify the key hardware and software components of VR and AR.

CO3: Apply basic design principles for VR and AR applications.

CO4: Analyse VR and AR applications in various domains.

CO5: Evaluate current trends and future challenges in VR and AR technologies.

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean CO
CO1	3	2	2	2	1	1	1	2	1	1	3	2	2	2	1	1.73
CO2	3	3	2	2	1	1	1	2	1	2	3	2	2	2	1	1.87
CO3	3	3	3	3	2	1	1	2	2	2	3	3	2	3	1	2.27
CO4	2	3	3	2	2	1	1	2	2	2	2	3	2	3	2	2.13
CO5	3	3	2	3	2	1	1	3	2	2	3	3	2	3	2	2.33
Average	2.80	2.80	2.40	2.40	1.60	1.00	1.00	2.20	1.60	1.80	2.80	2.60	2.00	2.60	1.40	2.07

Mean CO's : 2.07

3 - Strong, 2 - Medium , 1- Low

Year : First

**INTERDISCIPLINARY COURSE – I
FUNDAMENTALS OF INFORMATION TECHNOLOGY
(Theory)**

Semester : I

Code :

Credits: 2

COURSE OBJECTIVES :

This course aims to:

- ❖ identify the different generations and classifications of digital computers and define the basic anatomical components of a computer system.
- ❖ to explain the functions of the CPU, primary memory, and various input/output and secondary storage devices.
- ❖ to apply basic knowledge of programming languages, operating systems, and database management systems to interact with computer software.
- ❖ to analyze the structure of computer networks, the World Wide Web, and email systems to navigate and design basic web-based interfaces.
- ❖ to evaluate the diverse applications of computers in fields like medicine and engineering while constructing basic security strategies to protect against viruses, bombs, and worms.

UNIT I: INTRODUCTION TO COMPUTER

Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer..

UNIT II: COMPUTER HARDWARE

CPU and Memory - Secondary Storage Devices - Input Devices - Output Devices

UNIT III: COMPUTER SOFTWARE

Introduction to Computer Software - Programming Language - Operating System - Introduction to Database Management System.

UNIT IV: NETWORKS

Computer Networks - WWW and Internet - Email - Web Design.

UNIT V: APPLICATIONS AND SECURITY

Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

RECOMMENDED BOOKS:

1. 'Alexis Leon and Mathews Leon, Fundamentals of Information Technology, Vikas Publishing House Pvt. Ltd, 2009
2. Fundamentals of Computers and Information Technology, M.N Doja, 2005

REFERENCES:

1. Ramesh Bangia, "Computer Fundamentals and Information Technology", Laxmi Publications Pvt Limited, 2008.
2. Bharihoke, "Fundamentals of Information Technology", Excel Books, 2009.
3. Ralph Stair, George Reynolds, "Fundamentals of Information Systems" Cengage Learning, 2015

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Describe the historical evolution of computer generations and identify the anatomical components
- CO2 Explain the functional relationship between the CPU, primary memory
- CO3 Differentiate between system software and application software while applying the basic concepts of programming languages
- CO4 Analyze the structure of computer networks and the World Wide Web (WWW)
- CO5 Evaluate the role of computers across diverse fields like medicine and engineering

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	2	2	2	1	1	2	1	2	3	2	2	2	1	1.9
CO2	3	3	2	2	2	1	1	3	2	2	3	2	2	3	2	2.2
CO3	3	3	3	2	2	1	1	2	2	2	3	3	2	2	2	2.2
CO4	3	3	3	3	2	1	1	3	2	2	3	3	2	3	2	2.4
CO5	3	3	2	3	2	2	1	3	2	2	3	3	3	3	2	2.5
Average	3.0	3.0	2.4	2.4	2.0	1.2	1.0	2.6	1.8	2.0	3.0	2.6	2.2	2.6	1.8	2.3

Mean Co : 2.3

3 - Strong, 2 - Medium, 1- Low

Year : First

**INTERDISCIPLINARY COURSE – II
WORKING PRINCIPLES OF INTERNET
(Theory)**

Semester : II

Code :

Credits: 2

COURSE OBJECTIVES :

This course aims to:

- ❖ define the fundamental nature of the internet and identify the components of its underlying technical architecture
- ❖ describe the purpose of common internet tools and the role of multimedia in digital communication .
- ❖ apply standard protocols to establish stable internet connectivity and engage in effective online communication.
- ❖ to analyze various methods used for safeguarding the internet against external threats and data vulnerabilities.
- ❖ to evaluate the effectiveness of different internet security measures to protect both personal and organizational resources

UNIT I INTRODUCTION TO THE INTERNET

Introduction to Internet – Internet Basics – History and Evolution of the Internet – Internet Services – Internet Applications – Internet's Underlying Architecture – Client-Server Architecture – Internet Protocols.

UNIT II: INTERNET CONNECTIVITY AND COMMUNICATION

Connecting to the Internet – Types of Internet Connections – Internet Service Providers (ISP) – Communication on the Internet – E-mail – Instant Messaging – Online Communication Methods – Netiquettes.

UNIT III: INTERNET COMMUNICATION TOOLS

World Wide Web (WWW) – Working of the World Wide Web – Web Browsers – Search Engines – Web Pages and Websites – Common Internet Tools – E-mail Tools – FTP – Discussion Forums – Social Networking Tools.

UNIT IV: MULTIMEDIA, INTRANET AND E-COMMERCE

Multimedia on the Internet – Audio and Video Streaming – Multimedia Applications – Intranet – Features and Benefits of Intranet – Electronic Commerce (E-Commerce) – Online Shopping – Digital Payments – Advantages and Limitations of E-Commerce.

UNIT V: INTERNET SECURITY

Introduction to Internet Security – Safeguarding the Internet – Computer Viruses – Malware and Spyware – Firewalls – Antivirus Software – Password Security – Safe Browsing Practices – Cyber Threats and Protection Measures.

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

RECOMMENDED BOOKS:

1. Preston Gralla, "How the Internet Works", Pearson Education, Eighth Edition, 2006.
2. C.Xavier, Fundamentals of Internet and Emerging Technologies, New Age International Private Limited; First Edition, 2021

REFERENCES

1. Alexis Leon, Internet for Everyone, S. Chand (G/L) & Company Ltd; Second Edition 2012.
2. Andrea C. Nakaya, "Internet and Social Media Addiction", Reference Point Press, 2015.
3. Richard Fox, Wei Hao, "Internet Infrastructure: Networking, Web Services, and Cloud Computing", CRC Press, 2017.
4. Douglas E. Comer, "The Internet Book: Everything You Need to Know about Computer Networking and How the Internet Works", CRC Press, 2018

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Identify the core components of the internet and describe its underlying technical architecture
- CO2 Explain the functional mechanics of the World Wide Web
- CO3 Apply standard protocols to establish internet connectivity, engage in digital communication,
- CO4 Examine contemporary developments in technology and analyze the methods
- CO5 Evaluate the effectiveness of different internet security measures

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	2	3	2	2	2	2	1	1	1	1	2	3	2	2	1	1.8
CO2	3	3	2	2	2	2	1	1	2	2	3	3	3	3	2	2.3
CO3	3	3	3	1	2	3	2	3	3	2	3	2	2	2	1	2.3
CO4	3	3	3	3	3	2	2	3	1	2	3	3	3	3	2	2.6
CO5	3	3	1	3	2	3	1	2	2	3	3	3	2	2	2	2.3
Average	2.8	3.0	2.2	2.2	2.2	2.4	1.4	2.0	1.8	2.0	2.8	2.8	2.4	2.4	1.6	2.3

Mean Co : 2.3

3 - Strong, 2 - Medium, 1- Low

Year : Second

INTERDISCIPLINARY COURSE – III

Semester : III

WEB DESIGN

Code :

(Theory)

Credits: 2

COURSE OBJECTIVES :

This course aims to:

- ❖ Learn HTML basics and design simple web pages.
- ❖ Understand frames, framesets, and HTML forms for web design.
- ❖ Learn DHTML and CSS for dynamic and styled web pages.
- ❖ Study Chemical Markup Language (CML) and its web representation.
- ❖ Learn Mathematical Markup Language (MathML) for displaying equations on web pages.

UNIT – I: HTML BASICS AND WEB PAGE DESIGN

Designing a Home Page - HTML Document - Anchor Tag – Hyperlinks - Head and Body Sections - Header Section - Title - Prologue - Links - Colorful Pages – Comments - Body Section - Heading - Horizontal Ruler - Paragraph - Tabs – Images and Pictures - Lists and their Types - Nested Lists - Table Handling.

UNIT – II: FRAMES AND FORMS IN HTML

Frames: Frameset Definition - Frame Definition - Nested Framesets- Forms: Forms and their Elements.

UNIT – III: DHTML AND STYLE SHEETS

Defining Styles - Elements of Styles - Linking a Style Sheet to a HTML Document - Inline Styles - External Style Sheets - Internal Style Sheets - Multiple Styles - Web Page Designing.

UNIT – IV: CHEMICAL MARKUP LANGUAGE (CML)

Introduction to Chemical Markup Language (CML) – Importance of CML – Basic structure of a CML document – Representation of chemical elements, atoms, and molecules – Simple CML tags and attributes – Displaying chemical information on web pages .

UNIT – V: MATHEMATICAL MARKUP LANGUAGE (MATHML)

Introduction of Math ML – Importance of MathML in web design – Basic structure of a MathML document – Presentation MathML and Content MathML – Representing numbers, variables, and mathematical expressions – Simple MathML tags and attributes – Displaying mathematical equations on web pages .

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

RECOMMENDED BOOKS:

1. Xavier, “World Wide Web Designing”, Tata McGraw Hill, 2000.
2. Somnath Tagore, “Markup languages in Biology Studies in CML, BSML, SBML”, LAP Lambert Academic Publishing, 2012.
4. Michael Kohlhase, “OMDoc -- An Open Markup Format for Mathematical Documents”, Springer-Verlag Berlin and Heidelberg GmbH & Co. K, 2006.

REFERENCES:

1. N.P. Gopalan and J. Akilandeswari, Web Technology – A Developer’s Perspective, Prentice Hall of India Private Ltd, New Delhi, Second Edition, 2016.
2. Thomas Powell, “HTML & CSS: The Complete Reference”, McGraw Hill Education, 2017.
3. Shruti Dalela, “Web Designing with Practical Implementation”, Shripri Publications, 2024.
4. Prem Kumar, “Web Design With HTML & CSS : HTML & CSS Complete Beginner's Guide”, Notion Press, 2021.
5. Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, Third Edition, 2007.

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Create and design basic HTML web pages.
 CO2 Design web layouts using frames and develop HTML forms.
 CO3 Develop well-structured and user-friendly web interfaces using CSS.
 CO4 Represent chemical data using CML in web applications.
 CO5 Display mathematical expressions using MathML in web pages.

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	3	3	2	2	2	1	1	2	1	2	3	2	2	3	2	2.1
CO2	3	3	3	2	2	1	1	3	2	2	3	3	2	3	2	2.3
CO3	3	3	3	3	2	1	1	3	2	2	3	3	2	3	2	2.4
CO4	3	3	3	3	2	1	1	3	2	2	3	3	3	3	2	2.5
CO5	2	3	3	3	3	2	1	2	2	2	2	3	3	3	2	2.4
Average	2.8	3.0	2.8	2.6	2.2	1.2	1.0	2.6	1.8	2.0	2.8	2.8	2.4	3.0	2.0	2.4

Mean CO's : 2.4

3 - Strong, 2 - Medium, 1- Low

Year : Second

INTERDISCIPLINARY COURSE - IV

Semester : IV

Code :

**DIGITAL MARKETING
(Theory)**

Credits: 2

COURSE OBJECTIVES :

This course aims to:

- ❖ identify the historical transition from traditional to digital marketing and define core e-concepts essential for modern e-business
- ❖ explain the components of the online marketing mix (e-product, e-promotion, e-price, and e-place) and interpret the meaning and benefits of digital branding
- ❖ apply various digital media channels, including search engine marketing (SEM), ePR, affiliate marketing, and interactive display advertising to reach target audiences
- ❖ analyze online consumer behavior and the cultural implications of website characteristics to optimize digital engagement
- ❖ design and evaluate a digital brand analysis that incorporates brand share dimensions and audience insights to formulate a competitive market position

UNIT I: INTRODUCTION TO DIGITAL MARKETING

Digital Marketing – Transition from traditional to digital marketing – Growth of e-concepts – Growth of e-business.

UNIT II: ONLINE MARKETING MIX

Online marketing mix – E-product – E-promotion – E-price – E-place

UNIT III: DIGITAL MARKETING CHANNELS

Digital media channels – Search engine marketing – ePR – Affiliate marketing – Interactive display advertising

UNIT IV: CONSUMER BEHAVIOR IN DIGITAL MARKETING

Online consumer behavior – Cultural implications of key website characteristics.

UNIT V: DIGITAL BRANDING AND ANALYSIS

Digital brand analysis – Meaning – Benefits – Components – Brand share dimensions – Brand audience dimensions

UNIT – VI : CURRENT CONTOURS (Self-directed learning activities for continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

RECOMMENDED BOOKS:

1. Puneet Singh Bhatia, (2019) “Fundamentals of Digital Marketing”, 2nd Edition, Pearson Education Pvt Ltd, Noida.
2. Dave Chaffey, Fiona Ellis-Chadwick, (2019) “Digital Marketing”, Pearson Education Pvt Ltd, Noida.

REFERENCES:

1. Chuck Hemann & Ken Burbary, (2019) “Digital Marketing Analytics”, Pearson Education Pvt Ltd, Noida.
2. Seema Gupta, (2022) “Digital Marketing” 3rd Edition, McGraw Hill Publications Noida.
3. Kailash Chandra Upadhyay, (2021) “Digital Marketing: Complete Digital Marketing Tutorial”, Notion Press, Chennai.
4. Michael Branding, (2021) “Digital Marketing”, Empire Publications India Private Ltd, New Delhi

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able to:

- CO1 Describe the transition from traditional to digital marketing and explain the growth of e- business
- CO2 Students will be able to implement the four pillars of online marketing
Students will be able to apply various digital media channels, including search engine marketing (SEM), ePR, affiliate marketing, and interactive display advertising to reach target audiences.
- CO3
- CO4 Examine online consumer behaviour and evaluate how cultural implications
- CO5 Design comprehensive brand analyses by synthesizing brand share and audience dimensions to measure

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Mean COs
CO1	2	3	2	2	2	2	1	1	1	1	2	3	2	2	1	1.8
CO2	3	3	2	2	2	2	1	1	2	2	3	3	3	3	2	2.3
CO3	3	3	3	1	2	3	2	3	3	2	3	2	2	2	1	2.3
CO4	3	3	3	3	3	2	2	3	1	2	3	3	3	3	2	2.6
CO5	3	3	1	3	2	3	1	2	2	3	3	3	2	2	2	2.3
Average	2.8	3.0	2.2	2.2	2.2	2.4	1.4	2.0	1.8	2.0	2.8	2.8	2.4	2.4	1.6	2.3

Mean CO's : 2.3

3 – Strong, 2 - Medium , 1- Low