PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018

(AUTONOMOUS)

B.Tech. – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATIONS 2023

(CHOICE BASED CREDIT SYSTEM)

2023-2024 Onwards

CURRICULUM

for

I - SEMESTER TO VIII - SEMESTER

PAAVAI ENGINEERING COLLEGE (AUTONOMOUS)
Approved
Board of Studies
Artificial Intelligence & Data Science
NAMAKKAL-637018

PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637018
(AUTONOMOUS)
B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
REGULATIONS 2023
(CHOICE BASED CREDIT SYSTEM)
(Applicable to the students admitted during the academic year 2023-2024 onwards)
CURRICULUM
SEMESTER I

S. No	Category	Course Code	Course Title	L	T	P	C
1			Induction Programme				
Theory							
2	HS	GE23101	தமிழர்மரபு/ Heritage of Tamils	1	0	0	1
3	BS	MA23101	Matrices and Calculus	3	1	0	4
4	BS	CH23101	Applied Chemistry	3	0	0	3
5	ES	ME23101	Engineering Graphics	2	0	2	3
6	ES	CS23102	Programming in C	3	0	0	3
Theory with Laboratory							
7	HS	EN23101	Communication Skills for Engineers I	2	0	2	3
Practical							
8	BS	CH23104	Chemistry Laboratory	0	0	2	1
9	ES	GE23103	Civil and Mechanical Engineering Practices Laboratory	0	0	2	1
10	ES	CS23104	Programming in C Laboratory	0	0	4	2
			Total	**14**	**1**	**12**	**21**

SEMESTER II

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	HS	GE23201	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	1	0	0	1
2	BS	MA23202	Differential Equations and Numerical Techniques	3	1	0	4
3	BS	PH23201	Physics for Information Science	3	0	0	3
4	ES	EE23201	Basic Electrical and Electronics Engineering	3	0	0	3
5	ES	CS23201	Problem Solving and Python Programming	3	0	0	3
Theory with Laboratory							
6	HS	EN23201	Communication Skills for Engineers II	2	0	2	3
Practical							
7	BS	PH23204	Physics Laboratory for Information Science	0	0	2	1
8	ES	GE23202	Electrical and Electronics Engineering Practices Laboratory	0	0	2	1
9	ES	CS23202	Problem Solving and Python Programming Laboratory	0	0	4	2
			Total	**15**	**1**	**10**	**21**

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SEMESTER III

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA23303	Discrete Mathematics	3	1	0	4
2	PC	AD23301	Data structures	3	0	0	3
3	PC	AD23302	Object Oriented Programming	3	0	0	3
4	PC	AD23303	Software Engineering	3	0	0	3
5	MC	MC23301	Environmental Sciences and Sustainability	2	0	0	0
Theory with Practical							
6	ES	EC23306	Digital Principles and System Design	3	0	2	4
Practical							
7	PC	AD23304	Data Structures Laboratory	0	0	4	2
8	PC	AD23305	Object Oriented Programming Laboratory	0	0	4	2
9	EE	GE23301	Professional Development I	0	0	2	1
			Total	**17**	**1**	**12**	**22**

SEMESTER IV

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA23403	Probability and Statistics	3	1	0	4
2	PC	AD23401	Design and Analysis of Algorithms	3	1	0	4
3	PC	AD23402	Operating Systems	3	0	0	3
4	PC	AD23403	Database Management Systems	3	0	0	3
5	MC	MC23402	Human Values and Gender Equality	2	0	0	0
Theory with Practical							
6	PC	AD23404	Computer Networks	3	0	2	4
Practical							
7	PC	AD23405	Operating Systems Laboratory	0	0	4	2
8	PC	AD23406	Database Management Systems laboratory	0	0	4	2
9	EE	GE23401	Professional Development II	0	0	2	1
			Total	**17**	**1**	**12**	**23**

SEMESTER V

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	AD23501	Data and Information Security	3	1	0	4
2	PC	AD23502	Artificial Intelligence	3	0	0	3
3	PC	AD23503	Internet of Things	3	0	0	3
4	PC	AD23504	Foundation of Data Science	3	0	0	3
5	HS	GE23601	Entrepreneurship Development	3	0	0	3
6	PE	AD2315*	Professional Elective I	3	0	0	3
Practical							
7	PC	AD23506	Artificial Intelligence Lab	0	0	4	2
8	PC	AD23507	Internet of Things Lab	0	0	2	1
9	EE	AD23508	Industrial Training	0	0	2	1
10	EE	AD23509	Professional Development III	0	0	2	1
			Total	**18**	**1**	**10**	**24**

SEMESTER VI

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	AD23601	Cloud Computing	3	0	0	3
2	PC	AD23602	Machine Learning	3	0	0	3
3	PC	AD23603	Big Data and Analytics	3	0	0	3
4	PC	AD23604	Data Visualization	3	0	0	3
5	PE	AD2325*	Professional Elective II	3	0	0	3
6	OE	AD2390*	Open Elective I	3	0	0	3
Practical							
7	PC	AD23604	Machine Learning Lab	0	0	4	2
8	PC	AD23605	Data Visualization Laboratory	0	0	4	2
9	EE	AD23606	Design Thinking	0	0	2	1
			Total	**18**	**0**	**10**	**23**

SEMESTER VII

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	AD23701	Generative AI	3	0	0	3
2	PC	AD23702	Natural Language Processing	3	0	0	3
3	PC	AD23703	Deep Learning	3	0	0	3
4	PE	AD2335*	Professional Elective III	3	0	0	3
5	PE	AD2345*	Professional Elective IV	3	0	0	3
6	OE	AD2390*	Open Elective II	3	0	0	3
Practical							
7	PC	AD23704	Deep Learning Laboratory	0	0	4	2
8	EE	AD23705	Mini Project	0	0	6	3
			Total	**18**	**0**	**10**	**23**

SEMESTER VIII

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PE	AD2355*	Professional Elective V	3	0	0	3
2	PE	AD2365*	Professional Elective VI	3	0	0	3
Practical							
3	EE	AD23801	Project Work	0	0	12	6
			Total	**6**	**0**	**12**	**12**
							Total Credits : 169

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I AIDS I	Vertical II Full Stack Development for IT	Vertical III Cloud Computing and Data Center Technologies	Vertical IV Cyber Security and Data Privacy	Vertical V Creative Media	Vertical VI Emerging Technologies	Vertical VII AIDS II
Soft Computing	Full Stack Development	Software Defined Networks	Network Security	Multimedia and Animation	Neural Networks	Bio-Inspired Optimization Techniques
Knowledge Engineering	Open Vulnerability Assessment System	Cloud Services Management	Social Network Security	Multimedia Data Compression and Storage	Cryptocurrency and Blockchain Technologies	App Development
Recommender Systems	Open Source Systems	Storage Technologies	Modern Cryptography	UI and UX Design	Cyber Security	Introduction to toolkits for Machine Learning
Text and Speech Analysis	Software Testing and Automation	Data Warehousing	Security and Privacy in Cloud	Video Creation and Editing	Quantum Computing	Health Care Analytics
Business Analytics	Web Application Security	Virtualization	Digital and Mobile Forensics	Visual Effects	Robotic Process Automation	Game Theory
Image and video analytics	DevOps	Stream Processing	Ethical Hacking	Augmented Reality/Virtual Reality	3D Printing and Design	Cognitive Science
Computer Vision	Principles of Programming Languages	Edge Computing	Engineering Secure Software Systems	Game Development	Digital marketing	Ethics and AI

OPEN ELECTIVE COURSES OFFERED BY AI&DS TO OTHER DEPARTMENTS

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	OE	AD23901	IT Infrastructure Management	3	0	0	3
2	OE	AD23902	Foundations of Artificial Intelligence	3	0	0	3
3	OE	AD23903	Fundamentals of Data Science	3	0	0	3
4	OE	AD23904	Fundamentals of Internet of Things	3	0	0	3
5	OE	AD23905	Web Mining	3	0	0	3
6	OE	AD23906	Cloud Computing	3	0	0	3
7	OE	AD23907	Wearable Devices	3	0	0	3
8	OE	AD23908	Introduction to Machine Learning	3	0	0	3

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MINOR DEGREE IN DATA SCIENCE

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	AD23851	Data Science Fundamentals	3	0	0	3
2	PC	AD23852	Data Analytics	3	0	0	3
3	PC	AD23853	Advanced Python Programming	3	0	0	3
4	PC	AD23854	Business Analytics	3	0	0	3
5	PC	AD23855	Machine Learning Techniques	3	0	0	3
6	PC	AD23856	Deep Learning Techniques	3	0	0	3
			Total	**18**	**0**	**0**	**18**

SUMMARY

S.NO.	CATEGORY	CREDITS AS PER SEMESTER								TOTAL CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1	HS	04	04	-	-	-	03	-	-	11
2	BS	08	08	04	04	-	-	-	-	24
3	ES	09	09	04	-	-	-	-	-	22
4	PC	-	-	13	18	19	13	11	-	74
5	PE	-	-	-	-	03	03	06	06	18
6	OE	-	-	-	-	-	03	03	-	06
7	EE	-	-	01	01	02	01	03	06	14
8	MC	-	-	0	0	-	-	-	-	0
TOTAL		21	21	22	23	24	23	23	12	169

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ONE CREDIT COURSES

S.No	Category	Course Code	Course Title	L	T	P	C
1.	OCC	AD23951	Amcat (Online Placement Aptitude Certification)	0	0	2	1
2.	OCC	AD23952	E-litmus (Online Placement Aptitude Certification)	0	0	2	1
3.	OCC	AD23953	Nasscomnac-tech (Online Placement Aptitude Certification)	0	0	2	1
4.	OCC	AD23954	I-pat(Online Placement Aptitude Certification)	0	0	2	1
5.	OCC	AD23955	Oracle-SQL Fundamentals	0	0	2	1
6.	OCC	AD23956	Spoken Tutorial - JAVA Business Application	0	0	2	1
7.	OCC	AD23957	CCNA-Certification	0	0	2	1
8.	OCC	AD23958	SCJP/OCPJP-Sun Certified Java Programmer / Oracle Certified Professional Java Programmer	0	0	2	1
9.	OCC	AD23959	Android Application Development	0	0	2	1
10.	OCC	AD23960	PC Hardware and Trouble Shooting	0	0	2	1
11.	OCC	AD23961	E-Commerce Security	0	0	2	1
12.	OCC	AD23962	Coursera (Online Courses)	0	0	2	1
13.	OCC	AD23963	Edx (Online Courses)	0	0	2	1
14.	OCC	AD23964	Udemy(Online Courses)	0	0	2	1
15.	OCC	AD23965	NPTEL/Swayam (Online Courses)	0	0	2	1
16.	OCC	AD23966	Spoken Tutorial – R	0	0	2	1
17.	OCC	AD23967	Spoken Tutorial - Android APP Using KOTLIN	0	0	2	1
18.	OCC	AD23968	Spoken Tutorial - PHP and MySQL	0	0	2	1
19.	OCC	AD23969	Chat GPT	0	0	2	1
20.	OCC	AD23970	Office Automation	0	0	2	1
21.	OCC	EP23951	Soft Skill Laboratory I	0	0	2	1
22,	OCC	EP23952	Soft Skill Laboratory II	0	0	2	1

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VALUE ADDED COURSES

S.No	Course Code	Course Title (with 30 or more hours)
1	23ADVC401	Data Analytics with R
2	23ADVC501	AR VR and MR using Unity
3	23ADVC601	iOS App Development
4	23ADVC701	Full Stack Development
5	23ADVC801	Android App Development


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MA23303	DISCRETE MATHEMATICS	3	1	0	4

(Common to CSE, CSE(IOT), CSE(AI&ML), Cyber, AI&DS, IT)

COURSE OBJECTIVES

To enable the students to

1.	interpret the introductory concepts of Logic, which will enable them to model and analyze Physical phenomena involving arguments.
2.	implement the definitions of relevant vocabulary from quantifiers and inference and be able to perform related calculations.
3.	apply the methodologies involved in solving problems related to fundamental principles of sets and implement the mathematical ideas for relations.
4.	understand the concepts of functions and its types.
5.	acquire knowledge and understand the concepts of graphs and its models.

UNIT I	PROPOSITIONAL CALCULUS	12

Propositions - Logical connectives, Compound propositions, Conditional and bi-conditional propositions, Truth tables; Tautologies and contradictions; Contrapositive; Logical equivalences and implications - DeMorgan's Laws, Normal forms, Principal conjunctive and disjunctive normal forms; Rules of inference; Arguments - Validity of arguments.

UNIT II	PREDICATE CALCULUS	12

Predicates - Statement function, Variables, Free and bound variables; Quantifiers; Universe of discourse; Logical equivalences and implications for quantified statements; Theory of inference - The rules of universal specification and generalization; Validity of arguments.

UNIT III	SET THEORY	12

Basic concepts - Notations, Subset, Algebra of sets, The power set; Ordered pairs and Cartesian product; Relations on sets - Types of relations and their properties, Relational matrix and the graph of relation; Partitions; Equivalence relations. Partial ordering - Posets, Lattices as Posets, Properties of lattices.

UNIT IV	FUNCTIONS	12

Definitions of functions, Classification of functions, Type of functions, Examples, Composition of functions, Inverse functions; Binary and n-ary operations; Characteristic function of a set; Hashing functions; Recursive functions; Permutation functions.

UNIT V	GRAPHS	12

Graphs and graph models; Graph terminology and special types of graphs; Matrix representation of graphs and graph isomorphism; Connectivity - Euler and Hamilton paths.

	TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	apply propositional logic to validate the arguments.	Applying (K3)
CO2	apply the rules of inference and methods of proof in predicate calculus to verify the validity of arguments.	Applying (K3)
CO3	explain the knowledge of various set theoretic concepts.	Applying (K3)
CO4	characterize different types of functions and solve recurrence relations.	Understanding(K2)
CO5	apply the concepts of discrete structures such as Euler and Hamilton paths.	Applying (K3)

TEXT BOOKS

1. Trembly, J.P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill, 35th Reprint, 2008.
2. Veerarajan T., "Discrete Mathematics with Graph Theory and Combinatorics", Reprint Edition, Tata McGraw Hill Publishing Company, New Delhi, 2013.

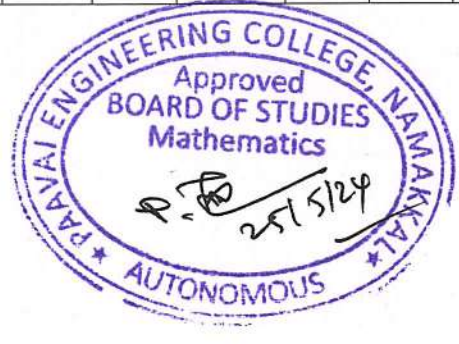
REFERENCES

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2012.
2. Tamilarasi, A., and Natarajan, A. M., "Discrete Mathematics and its Applications", 3rd Edition, Khanna Publishers, 2008.
3. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
4. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction ", 4th Edition, Pearson Education, 2002.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium,1-Weak

COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	3	1	2
CO2	3	2	3	3	-	-	-	-	-	-	-	3	1	2
CO3	2	3	3	2	-	-	-	-	-	-	-	2	1	2
CO4	2	2	2	3	-	-	-	-	-	-	-	2	1	2
CO5	3	3	3	3	-	-	-	-	-	-	-	3	1	2



AD23301	DATA STRUCTURES	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1. understand the concepts of ADTs.
2. learn linear data structures like lists, stacks.
3. apply linear data structures for queues.
4. apply Non-linear data structures for various application.
5. acquire different types of sorting, searching and hashing algorithms.

UNIT I	ABSTRACT DATA TYPES (ADT)	9

Introduction to Data Structures - Definition, Need of Data Structures, Types of Data Structures; Abstract Data Types (ADT) - List ADT, Operations (Insertion, Deletion), Array Based Implementation, Linked List Implementation, Singly Linked List, Doubly Linked List, Circularly Linked List; Applications of Linked List - Polynomial ADT.

UNIT II	LINEAR DATA STRUCTURES – STACKS	9

Stack ADT – Definition of Stack, Operations, Array based Implementations, Linked List Implementation; Applications of Stack - Conversion of Infix to prefix expression, Conversion of Infix to postfix expression.

UNIT III	LINEAR DATA STRUCTURES – QUEUES	9

Queue ADT – Definition of Queue, Operations, Array based Implementations, Linked List Implementation; Circular Queue; Priority Queue; Applications of Queue.

UNIT IV	NON-LINEAR DATA STRUCTURES – TREES, GRAPHS	9

Tree ADT - Basic Tree Terminologies, Binary Tree ADT, Expression Trees, Tree Traversals, Applications of Trees, Binary Search Tree ADT, AVL Trees; Graph – Definitions, Representation of Graphs, Types of Graphs, Depth-first traversal, Breadth-first traversal, Topological Sort.

UNIT V	SEARCHING, SORTING AND HASHING TECHNIQUES	9

Searching - Linear Search, Binary Search; Sorting - Bubble Sort, Insertion Sort, Shell Sort, Radix Sort, Heap Sort; Hashing - Hash Functions, Separate Chaining, Open Addressing, Rehashing, Extendible Hashing.

	TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	understand the different data structures for representation.	Understanding (K2)
CO2	select various linear data structures for problem-solving using stack.	Analyzing (K4)
CO3	solve the computational problems using queue.	Applying (K3)
CO4	examine of various concepts of trees and graphs with real time application.	Applying (K3)
CO5	demonstrate the concept of sorting, searching and hashing techniques.	Analyzing (K4)

TEXT BOOKS

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,2020.
2. Reema Thareja, —Data Structures Using C, Second Edition, Oxford University Press, 2018.

REFERENCES

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson Freed, "Fundamentals of Data Structures in C", 2nd Edition,Universities Press, Hyderabad, 2018.
3. R.Venkatesan, S.Lovelyn Rose, "Data Structures", 1st Edition, Wiley, 2019.
4. Seymour Lipschutz, "Data Structures with C", 4th Edition, MCGraw Hill Education, 2017.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	2	3	3	-	-	-	-	-	1	3	3	2
CO2	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO3	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO4	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO5	3	3	3	-	3	-	-	-	-	-	1	3	3	2

AD23302	OBJECT ORIENTED PROGRAMMING	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1.	understand OOP concepts and basics of Java programming language.
2.	know the principles of inheritance, packages, and interfaces.
3.	develop a java application with threads and generics classes.
4.	define exceptions and use I/O streams.
5.	understand Graphical User Interface Application using JavaFX.

UNIT I	INTRODUCTION TO OOP AND JAVA	9

Overview of OOP – Object Oriented Programming paradigms – Features of Object-Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments.

UNIT II	INHERITANCE, PACKAGES AND INTERFACES	9

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – Final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT III	EXCEPTION HANDLING AND MULTITHREADING	9

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

UNIT IV	I/O, GENERICS, STRING HANDLING	9

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files – Streams - Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT V	JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS	9

JavaFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – HBox and VBox – Border Pane – Stack Pane – Grid Pane. Menus – Basics – Menu – Menu bars – Menu Item.

	TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	explain the basic OOP and Java concepts.	Understanding (K2)
CO2	demonstrate programs using inheritance, packages and interfaces.	Applying (K3)
CO3	assign exception handling mechanisms and multithreading concepts to solve real-world problems.	Applying (K3)
CO4	customize Java applications with I/O packages, string classes, collections and generics concepts.	Applying (K3)
CO5	apply the concepts of event handling, JavaFX components and controls for developing GUI based applications.	Applying (K3)

TEXT BOOKS

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019.
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015.

REFERENCES

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.
2. Deitel & Deitel, "Java: How to Program", Prentice Hall of India, 2010.
3. Allen B. Downey and Chris Mayfield, "Think Java: How to Think Like a Computer Scientist", O'Reilly, California, First Edition, 2016.
4. Joshua Bloch, "Effective Java: A Programming Language Guide", Addison-Wesley Professional, US, Third Edition, 2018.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	2	3	2	-	-	-	-	-	-	2	2	2
CO2	2	2	3	3	2	-	-	-	-	-	-	2	2	2
CO3	3	3	2	2	2	-	-	-	-	-	-	2	2	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2	2	2
CO5	2	2	3	2	2	-	-	-	-	-	-	2	2	2

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AD23303	SOFTWARE ENGINEERING	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1. learn the nature of software , software process and software ethics
2. understand process models and the types of software requirements and software design
3. know how to model using UML
4. understand the different categories of software testing
5. learn the working knowledge of the techniques for estimation, software process/product metrics, risk management, quality management

UNIT I	INTRODUCTION TO SOFTWARE ENGINEERING	9

The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models, Software Ethics: Seven Principles

UNIT II	PROCESS MODELS	9

The waterfall model, incremental process models, evolutionary process models, the unified process model, agile process models. Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT III	SYSTEM MODELS	9

Context models, behavioural models, data models, object models, structured methods. Design Engineering: Design process and design quality, design concepts, the design model, Modelling component level design: Design class based components, conducting component level design, User Interface design: Golden Rules

UNIT IV	TESTING STRATEGIES	9

A strategic approach to software testing, test strategies for conventional software, stages of testing, black-box and white-box testing, Functional and Non-Functional testing, validation testing, system testing, the art of debugging and software inspections, automation testing tools – Selenium, Product metrics: Software quality, metrics for analysis model, metrics for design model

UNIT V	PROJECT MANAGEMENT	9

Process and Project Metrics - Estimation for Software projects – Project Planning & Project Scheduling, Risk management: Reactive vs proactive risk strategies, software risks, Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, software reliability, ISO 9000 quality standards, Software change

	TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	classify different process assessment models and describe CMMI for real life scenarios .	Understanding (K2)
CO2	choose the appropriate process model and develop proper documentation with the minimum requirements for the development of software application.	Applying (K3)
CO3	evaluate requirements to high level design models to develop scalable, maintainable, and reliable software systems.	Analysing (K4)
CO4	illustrate different testing strategies and methods to test and ensure the quality and reliability of software products.	Analysing (K4)
CO5	determine the cost of software and prepare software project planning and. to solve risks identified to produce quality software prodcut	Applying (K3)

TEXT BOOKS

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 9th edition, Mc Graw Hill International Edition,2023
2. Software Engineering- Sommerville, 10th edition, Pearson Education, 2021

REFERENCES

1. The unified Modeling Language User Guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education,2017
2. Software Engineering Principles and Practice- Waman S Jawadekar, The Mc Graw-HillCompanies, 5th Edition, 2013.
3. Fundamentals of Object-Oriented Design using UML Meiler Page-Jones: Pearson Education, 2nd Edition,2015
4. Pankaj Jalote, "Software Project Management in Practice", Pearson Education, New Delhi, 3rd Edition, 2019

CO PO MAPPING

Mapping of Course Outcomes(COs) with Programme Outcomes(POs) and Programme Specific Outcomes(PSOs):
(1,2,3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	3	-	3	2	2	-	2	2
CO2	2	3	-	2	-	3	-	2	3	3	-	-	2	2
CO3	2	2	3	2	3	-	-	-	2	3	-	-	2	3
CO4	2	2	-	-	3	-	-	2	3	2	2	-	2	3
CO5	2	2	2	-	-	-	-	-	1	2	3	-	2	2

MC 23301	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	2	0	0	0

COURSE OBJECTIVES

To enable the students to

1	establish the knowledge of precious resources of the environment and their various impacts.
2	create awareness on ecosystem and biodiversity preserve.
3	learn scientific and technological solutions to current day pollution issues.
4	analyze climate changes, concept of carbon credit and the challenges of environmental management.
5	understand green materials, energy cycles and the role of sustainable urbanization.

UNIT I	ENVIRONMENT AND NATURAL RESOURCES	6

Definition, scope and importance of Environment. Forest resources: Use and over-exploitation, deforestation, - mining, dams and their effects on forests and tribal people. Water resources: Use and over- utilization of surface and ground water, dams-benefits and problems. Food resources: effects of modern agriculture, fertilizer-pesticide problems. Role of an individual in conservation of natural resources.

UNIT II	ECOSYSTEMS AND BIODIVERSITY	6

Concept of an ecosystem: Structure and function of an ecosystem - ecological succession - food chains and food webs. Ecosystems- Types of ecosystem: Introduction - forest ecosystem and lake ecosystems. Biodiversity: Introduction - definition (genetic - species - ecosystem). Diversity - Value of biodiversity - Hotspots of biodiversity - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III	ENVIRONMENTAL POLLUTION	6

Pollution: Définition - air pollution - water pollution - marine pollution - noise pollution. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - Electronic waste -Sources-Causes and its effects- Pollution case studies-Field study of local polluted site – Industrial/Agricultural

UNIT IV	SUSTAINABILITY AND ENVIRONMENT	6

Sustainability - from unsustainability to sustainability-millennium development goals, and protocols. Sustainable development goals-targets, indicators and intervention areas. Climate change— acid rain - ozone layer depletion. Regional and local environmental issues and possible solutions-case studies. Concept of carbon credit, carbon footprint. Environmental management in industry-A case study.

UNIT V	SUSTAINABILITY PRACTICES	6

Zero waste and R concept, Circular economy, ISO 14000 Series, Environmental Impact Assessment - Sustainable energy: Non-conventional Sources, Green materials, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economical and technological change.

	TOTAL PERIODS	30

COURSE OUTCOMES		
At the end of this course, students will be able to		BT Mapped (Highest Level)
CO1	find the method of conservation of natural resources	Understanding(K2)
CO2	understand ecosystem and the conservation of biodiversity.	Understanding(K2)
CO3	aware of environmental pollution and interpret its effects.	Understanding(K2)
CO4	apply sustainable development for technological advancement and societal development.	Applying (K3)
CO5	measure the sustainability practices for green energy cycles.	Analyzing (K4)

TEXT BOOKS

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, 1st edition, 2017.
2. Gilbert M. Masters, Wendell P. Ela " Introduction to Environmental Engineering and Science", 3rd edition, Pearson, 2022.

REFERENCES

1. William P. Cunningham and Mary Ann Cunningham, "Environmental Science: A Global Concern", McGraw Hill, 16th edition, 2023.
2. C. S. Rao, Environmental Pollution and Control engineering, New Age International (P) ltd Publication, New Delhi, 4th edition, 2021.
3. Erach Bharucha, "Textbook of Environmental Studies", Universities Press Pvt. Ltd., edition, 2020.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 4th Edition, 2015.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	PO's												PSO's	
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	-	-	2	-	-	1	1	-	-	-	-
CO2	-	2	-	-	1	1	-	1	-	-	-	-	-	-
CO3	2	-	1	1	-	-	-	2	-	-	-	2	-	-
CO4	-	2	-	-	1	-	3	1	1	-	1	1	-	-
CO5	2	2	-	1	-	-	2	1	-	-	-	1	-	-

EC23306	DIGITAL PRINCIPLES AND SYSTEM DESIGN	3	0	2	4

Common to CSE, IT, CSE(AIML) and CSE(AIDS)

COURSE OBJECTIVES

To enable the students to

1. understand the fundamentals of Boolean algebra and digital logic gates.
2. know the concepts of various combinational circuits.
3. gain knowledge about different synchronous sequential circuits.
4. be familiar with the operation of asynchronous sequential circuits.
5. acquire basic knowledge about Memory and Programmable Logic Devices.

UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Boolean laws and Theorem, Boolean functions - Canonical and Standard forms - Sum of Products, Product of Sums; Simplifications of Boolean functions - Karnaugh map, Quine McCluskey method, Don't care Conditions; Implementations of Boolean Functions using logic gates, NAND, NOR.

UNIT II	COMBINATIONAL CIRCUITS	9

Design procedure of Combinational circuits - Adders, Subtractors, 4-bit Parallel adder / Subtractor, Carry look ahead adder, BCD adder, Multiplexer, Demultiplexer, Encoder, Decoder, 2-bit Magnitude Comparator; Code converters, Parity generator and checker.

UNIT III	SEQUENTIAL CIRCUITS	9

Latches, Flip flops - SR, JK, D, T Flip-flops, Realization of flip flop using other flip flops; Classification of sequential circuits - Asynchronous and Synchronous counters; Moore and Mealy; Design of Synchronous counters - Modulo - N counter; Shift registers - SISO, SIPO, PISO, PIPO.

UNIT IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9

Design of fundamental mode and pulse mode circuits - Primitive flow table, Minimization of Primitive flow table, State assignment, Excitation table; Cycles - Race Free State assignment; Hazards - Static, Dynamic, Essential Hazards, Elimination of Hazards.

UNIT V	MEMORY AND PROGRAMMABLE LOGIC DEVICES	9

Classification of memories - ROM organization, types; RAM organization, types - Static RAM Cell, Dynamic RAM cell; Memory Expansion; Programmable Logic Devices - PLA, PAL, Basics of FPGA.

TOTAL PERIODS | **45**

LIST OF EXPERIMENTS

1. Design and implementation of Adders and Subtractors using logic gates.
2. Design and implementation of Binary to Gray code and Gray to Binary code Code converters using logic gates.
3. Design and implementation of Multiplexer, Demultiplexer.

4. Design and implementation of Encoder and decoder.	
5. Design and implementation of 4-bit Ripple counter / 3-bit synchronous Up/Down counter.	
6. Implementation of 4-bit shift registers using Flip flops. (SISO/ SIPO/PISO/PIPO).	
TOTAL PERIODS	**75**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	apply Boolean functions in digital design.	Apply (K3)
CO2	design and implement combinational circuits.	Apply (K3)
CO3	design and implement synchronous sequential circuits.	Apply (K3)
CO4	analyze the types of asynchronous sequential circuits.	Analyze (K4)
CO5	classify memory devices and PLDs.	Understand (K2)

TEXT BOOKS

1. M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 6th Edition, 2018.
2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson / Brooks cole, 2015.

REFERENCES

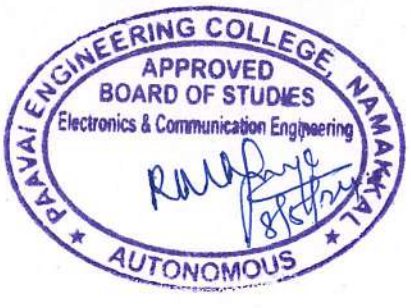
1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 4th Edition, Vikas Publishing House Pvt.Ltd, New Delhi, 2012.
2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson Publications, New Delhi, 2007.
3. Charles H.Roth, "Fundamentals of Logic Design", 6th Edition, Thomson Publication Company, 2010.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5th edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's)

(1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

CO's	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	-	1	-	-	-	1	1	-	2	2	2
CO2	3	2	2	-	1	-	-	-	1	1	-	2	2	2
CO3	3	2	2	-	1	-	-	-	1	1	-	2	2	2
CO4	3	2	2	-	1	-	-	-	1	1	-	2	2	2
CO5	3	1	2	-	1	-	-	-	1	1	-	2	2	2



AD23304	DATA STRUCTURES LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1.	implement basic data structure using an array.
2.	implement linear data structures.
3.	apply various operations on non-linear data structures.
4.	get familiarized to sorting and searching algorithms.

LIST OF EXPERIMENTS

1. Array implementation of List ADT.
2. Linked List Implementation of Singly and Doubly Linked List.
3. Array Implementation of Stack ADTs.
4. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion.
5. Array Implementation of Queue ADTs.
6. Applications of Queue ADTs.
7. Implementation of Binary Search Trees.
8. Implementation of AVL Trees.
9. Implementation of Graph Traversal algorithms.
10. Implementation of Linear Search and Binary Search.
11. Implementation of Insertion Sort and Bubble Sort.
12. Implementation of Hashing–any one collision techniques.

TOTAL PERIODS	**60**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	develop a basic data structure using an array.	Applying (K3)
CO2	perform various operations in stacks, queues, linked list.	Applying (K3)
CO3	implement various operations on non-linear data structures.	Applying (K3)
CO4	apply searching and sorting techniques for given data.	Applying (K3)

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	-	3	-	-	-	2	-	1	3	3	1
CO2	3	3	3	-	3	-	-	-	2	-	1	3	3	1
CO3	3	3	3	-	3	-	-	-	2	-	1	3	3	1
CO4	3	3	3	-	3	-	-	-	2	-	1	3	3	1

AD23305	OBJECT ORIENTED PROGRAMMING LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1.	build software development skills using java programming for real-world applications.
2.	understand and apply the concepts of classes, packages, and interfaces.
3.	implement exception handling and perform file processing.
4.	develop applications using generic programming and event handling.

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion).
2. Develop stack and queue data structures using classes and objects.
3. Write a Java program to demonstrate the concept of package.
4. Solve the above problem using an interface.
5. Implement exception handling and creation of user defined exceptions.
6. Write a Java program that implements a multi-thread application.
7. Write a program to perform file operations.
8. Write a Java program to handle all mouse events and key events using Adapter classes.
9. Develop applications to demonstrate the features of generics classes.
10. Develop applications using JavaFX controls, layouts and menus.
11. Create a Java application for Student Information System. It is used to store, administer and manage all aspects of student information such as student details, subjects, semesters, enrollment details, grades of students, etc.
12. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for digits and for the + - * / % operations. Add a text field to display the result.

TOTAL PERIODS	**60**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	analyze software development skills for real-world applications.	Applying (K3)
CO2	investigate different methodologies to create application using classes, packages, and interfaces.	Applying (K3)
CO3	explore exception handling and perform file processing.	Applying (K3)
CO4	create applications using generic programming and event handling.	Applying (K3)

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	-	3	-	-	-	2	-	1	3	3	-
CO2	3	3	3	-	3	-	-	-	2	-	1	3	3	-
CO3	3	3	3	-	3	-	-	-	2	-	1	3	3	-
CO4	3	3	3	-	3	-	-	-	2	-	1	3	3	-

GE23301	PROFESSIONAL DEVELOPMENT I	0	0	2	1

COURSE OBJECTIVES

To enable students to

1	enhance and evaluate the student's potential strength, personality skills and reduce weakness to survive.
2	enhance and develop the students behavioral, speaking and listening skills to face the interview.
3	solve the quantitative aptitude problems and improve their problem-solving skills.
4	improve their reasoning skills to get placed in reputed companies.

UNIT I	SELF - UNDERSTANDING AND PERSONALITY ENHANCEMENT SKILLS	7

Introduction: Self Exploration, SWOT Analysis - Types and Barriers - Effective Communication in Workplace - Leadership Skills - Decision Making - Problem Solving - Goal Setting - Critical, Strategic and Lateral Thinking, JAM Level - 1, Basic Resume Building Level – 1.

UNIT II	BEHAVIOURAL SKILLS, LISTENING AND SPEAKING SKILLS	7

Behavioral Skills: Time Management - Emotional Intelligence - Analytical Thinking; Listening - Listening and Hearing - Self Introduction - Group Discussion: Types and Importance - Evaluation Criteria - Do's and Don'ts of GD - GD Level-1.

UNIT III	QUANTITATIVE APTITUDE	8

Number System - LCM and HCF - Simple Interest and Compound Interest - Average - Pipes and Cisterns - Area - Profit and Loss.

UNIT IV	LOGICAL REASONING	8

Logical Sequence - Analogy - Classification - Causes and Effect - Making Judgment – Directions.

TOTAL PERIODS	30

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	define and analyze soft skills to improve the leadership skills.	Analyzing (K4)
CO2	demonstrate the behavioral skills through various activities.	Applying (K3)
CO3	develop the problem solving skills through quantitative aptitude.	Applying (K3)
CO4	illustrate the logical reasoning Skills to solve real world problems.	Analyzing (K4)

TEXTBOOKS

1. Agarwal, R.S. "Objective General English", S.Chand&Co.2021.
2. Agarwal, R.S. "Quantitative Aptitude", S.Chand&Co.2021.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill.2023.
2. Agarwal, R.S." A Modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, newdelhi.2021
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications.2021.

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	Programme Outcomes (PO's)													
	P01	P02	P03	PO4	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	1
CO2	-	-	-	-	-	-	2	3	2	3	-	3	2	1
CO3	3	2	2	2	-	-	1	-	-	-	-	-	1	2
CO4	2	3	3	2	-	3	3	1	-	1	2	-	2	2

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
English
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AUTONOMOUS

MA23403	PROBABILITY AND STATISTICS	3	1	0	4

(Common to Agri, Biotech, Cyber, CSE, CSE(IOT), CSE(AI&ML), AI&DS, IT, Food, Pharma)

COURSE OBJECTIVES

To enable the students to

1.	analyse the concept of random variables and probability distribution in designing processes.
2.	differentiate the discrete and continuous two dimensional random variables.
3.	determine the concepts of hypotheses testing, its need and applications.
4.	equip with statistical techniques for designing experiments, analyzing, interpreting and presenting research data.
5.	emphasize the aspects of control charts in quality control.

UNIT I	RANDOM VARIABLES	12

Discrete and continuous random variables – Moments, Moment generating functions; Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions; Functions of random variables.

UNIT II	TWO - DIMENSIONAL RANDOM VARIABLES	12

Joint distributions; Marginal and conditional distributions; Covariance, Correlation and Linear regression; Transformation of random variables; Applications of Central limit theorem (for independent and identically distributed random variables).

UNIT III	TESTING OF HYPOTHESIS	12

Sampling distributions - Estimation of parameters; Statistical hypothesis; Large sample test for single mean and difference of means; Small samples - Tests based on t, Chi-square and F distributions for mean, variance and proportion; Contingency table (test for independent), Goodness of fit.

UNIT IV	DESIGN OF EXPERIMENTS	12

Completely randomized design; Randomized block design; One way and two way classifications- Latin square design - 2^2 factorial design.

UNIT V	STATISTICAL QUALITY CONTROL	12

Control charts for measurements (X and R charts) - Control charts for attributes (P, C and NP charts), Tolerance limits, Acceptance sampling - U-test and Sign test.

	TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	assign suitable probability distributions in engineering problems.	Understanding (K2)
CO2	apply the concept of discrete and continuous two dimensional random variables.	Analyzing (K4)
CO3	apply the concept of testing of hypothesis for small and large samples in real life problems	Applying (K3)
CO4	analyse the principles to be adopted for designing the experiments.	Applying (K3)
CO5	examine statistical data using control chart in quality control	Analyzing (K4)

TEXT BOOKS

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4thEdition, 2007.
2. Johnson. R.A. and Gupta. C.B., Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7thEdition, 2007.

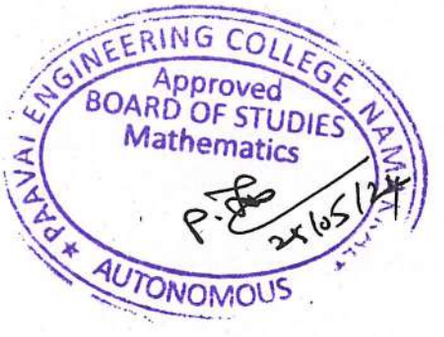
REFERENCES

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8thEdition, 2012.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education Asia, 8thEdition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	1	2
CO2	3	2	3	3	-	-	-	-	-	-	-	3	1	2
CO3	3	3	3	2	-	-	-	-	-	-	-	2	1	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	1	2
CO5	3	3	2	3	-	-	-	-	-	-	-	2	1	2



AD23401	DESIGN AND ANALYSIS OF ALGORITHMS	3	1	0	4

COURSE OBJECTIVES

To enable the students to

1.	understand the different techniques for problem solving and algorithm design.
2.	analyze the importance of brute force and divide and conquer techniques.
3.	apply dynamic programming and greedy techniques to solve problem.
4.	learn the iterative design techniques for real problem.
5.	acquire knowledge of backtracking and branch & bound techniques.

UNIT I	INTRODUCTION	12

Algorithm - Fundamentals of Algorithmic Problem Solving - Important Problem Types - Fundamentals of the Analysis of Algorithm Efficiency - Analysis Framework, Asymptotic Notations and its Properties; Mathematical Analysis of Recursive and Non - Recursive Relations (Selection Sort, Towers of Hanoi).

UNIT II	BRUTE FORCE AND DIVIDE-AND-CONQUER	12

Brute Force – Sequential Search and String Matching, Closest-Pair and Convex-Hull Problems, Exhaustive Search: Travelling Salesman Problem, Knapsack Problem, Assignment Problem; Divide and Conquer methodology - Merge sort, Quick sort, Binary Search, Multiplication of Large Integers and Strassen's Matrix Multiplication, Closest Pair Problem and Convex Hull Problem.

UNIT III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	12

Dynamic Programming - Computing a Binomial Coefficient, Knapsack Problem and Memory functions, Optimal Binary Search Trees, Warshall's and Floyd's algorithms; Greedy Technique - Prim's algorithm, Kruskal's algorithm, Dijikstra's algorithm, Huffman trees and Codes.

UNIT IV	ITERATIVE IMPROVEMENT AND LIMITATIONS OF ALGORITHM POWER	12

The Simplex Method - The Maximum-Flow Problem - Maximum Matching in Bipartite Graphs - The Stable marriage Problem; Limitation of Algorithm Power - Lower Bound Arguments, Decision Trees, P, NP, NP Complete Problems.

UNIT V	COPING WITH THE LIMITATIONS OF ALGORITHM POWER	12

Backtracking - n-Queen problem, Hamiltonian Circuit Problem, Subset Sum Problem; Branch and Bound - Assignment problem, Knapsack problem, Travelling Salesman Problem; Approximation Algorithms for NP-hard Problems - Traveling Salesman problem, Knapsack problem.

	TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	examine the various frameworks for algorithmic design.	Applying (K3)
CO2	apply brute force and divide-and-conquer techniques to various problems and analyze their efficiency.	Analyzing (K4)
CO3	make use of dynamic programming and greedy techniques to solve problems.	Applying (K3)
CO4	analyze the problem using iterative design techniques.	Analyzing (K4)
CO5	solve difficult combinatorial problems with backtracking and branch & bound techniques.	Analyzing (K4)

TEXT BOOKS

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

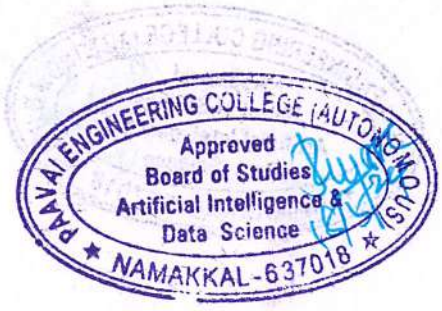
REFERENCES

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2013.
2. Steven S. Skiena, "The Algorithm Design Manual", Third Edition, Springer, 2021.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2016.
4. Harsh Bhasin, "Algorithms Design and Analysis", Oxford University Press, 2016.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	-	1	-	-	-	2	-	1	2	3	1
CO2	3	3	3	-	1	-	-	-	2	-	1	2	3	1
CO3	3	3	3	-	1	3	-	-	2	-	1	2	3	1
CO4	3	3	3	-	1	-	-	-	2	-	1	2	3	1
CO5	3	3	3	-	1	3	-	-	2	-	1	2	3	1



AD23402	OPERATING SYSTEMS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1. understand the basic concepts and functions of operating systems.
2. acquire knowledge about processes, threads, scheduling algorithms and concept of deadlocks.
3. analyze various memory management schemes.
4. learn file system interfaces and implementation process.
5. be familiar with virtual machines , clouds and IOT Operating Systems.

UNIT I	INTRODUCTION TO OPERATING SYSTEMS	9

Introduction - Computer system organization, Operating Systems and types, Operating system structures, Services, System calls, System programs; Processes - Process concept, Process scheduling, Operations on Processes, Cooperating processes, Inter process communication; Threads - Overview, Multi-threading models - Threading issues.

UNIT II	PROCESS MANAGEMENT AND DEADLOCK	9

CPU Scheduling - Concepts-scheduling criteria, Scheduling algorithms, Algorithm Evaluation; Process Synchronization - The critical-section problem, Synchronization hardware; Semaphores, Classic problems of synchronization - Monitors; Deadlock-System model - Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III	MEMORY MANAGEMENT	9

Main Memory – Background, Swapping, Contiguous memory allocation, Paging Segmentation, Segmentation with paging; Virtual Memory – Background, Demand paging, Page replacement, Allocation of frames, Thrashing.

UNIT IV	FILE SYSTEMS	9

File-System Interface - File concept, Access methods, Directory structure, File system mounting, File sharing, Protection; File-System Implementation - Directory implementation, Allocation methods, Free-space management, efficiency and performance, recovery, Network file systems.

UNIT V	I/O SYSTEMS	9

I/O Systems - I/O Hardware - Application I/O interface - kernel I/O subsystem - streams - Performance; Disk attachment - Disk scheduling - Disk management - Storage Device Management - Swap-space management - RAID - stable storage.

	TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	identify appropriate system calls for a given service using various OS services and structure.	Understanding (K2)
CO2	apply different methods for process synchronization and handling deadlock.	Apply (K3)
CO3	make use of memory management strategies and page replacement policies to address demand paging.	Analyze (K4)
CO4	apply various file system concepts for memory management.	Apply (K3)
CO5	make use of memory management strategies for storing data.	Understanding (K2)

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", Tenth Edition, Wiley India Pvt Ltd, 2018.
2. William Stallings, Operating Systems: Internals and Design Principles, 9th Edition Prentice Hall of India, 2018.

REFERENCES

1. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education, 2014.
2. Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2007.
3. Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall, 3rd Edition, 2006.
4. Gary J.Nutt, "Operating Systems", Pearson/Addison Wesley, 3rd Edition, 2004.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	3	-	-		-	-	-	1	-	-	-	2	1
CO2	3	3	3	-	3	-	-	-	1	-	-	1	2	1
CO3	2	3	3	-	3	-	-	-	1	-	1	2	2	1
CO4	2	3	3	-	3	-	-	-	1	-	2	3	2	1
CO5	3	3	-	-	-	-	-	-	3	3	2	3	1	3

AD23403	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1. explore the fundamentals of DBMS and Relational Model.
2. acquire the knowledge about basic, intermediate and advanced SQL.
3. design the database with Query Languages and E-R model.
4. apply the normalization and understand the storage and File structure.
5. implement the query processing, optimization and Transaction.

UNIT I INTRODUCTION 9

Introduction- Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators; Relational Model - Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages-Relational Operations.

UNIT II INTRODUCTION TO SQL AND INTERMEDIATE AND ADVANCED SQL 9

Introduction to SQL- Overview of the SQL Query Language, Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested Sub queries; Intermediate & Advanced SQL - Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization, Functions and Procedures, Triggers.

UNIT III DATABASE DESIGN 9

Relational Query Languages - The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus; E-R Model - The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Entity-Relationship Design Issues.

UNIT IV RELATIONAL DATABASE DESIGN AND STORAGE AND FILE STRUCTURE 9

Relational Database Design - Features of good relational designs, Functional dependency, Decomposition using functional dependencies, Normal Forms, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF; Storage and File Structure - Physical Storage Media, Magnetic Disk and Flash Storage, RAID, Tertiary Storage, File Organization, Organization of Records in Files, Data-Dictionary Storage.

UNIT V QUERY PROCESSING, QUERY OPTIMIZATION AND TRANSACTIONS 9

Query Processing and Query Optimization - Selection Operation, Sorting, Join Operation, Heuristic optimization, Cost based optimization; Transaction - Transaction concept, Transaction Atomicity and Durability, Transaction Isolation Serializability, Transaction Isolation and Atomicity, Transaction Isolation levels, Implementation of Isolation Levels.

TOTAL PERIODS 45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	describe the database architecture and schema diagrams.	Understanding (K2)
CO2	explore Structured Query Language for creating databases.	Applying (K3)
CO3	design a database using Relational Query Languages and E-R model	Applying (K3)
CO4	choose the appropriate normal form for the given database.	Analysing (K4)
CO5	make use of query processing, optimization and Transaction for finding best performance.	Analysing (K4)

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.

REFERENCES

1. Ramakrishna R. & Gehrke J, Database Management Systems, third edition, Mc-Graw Hill,2022.
2. Elmasri Ramez and Navathe Shamkant B., "Fundamental Database Systems", 7th Edition, Pearson Education, New Delhi, 2017.
3. Majumdar, A. K., and Bhattacharyya, P. Database Management Systems. McGraw-Hill, 2017.
4. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, New Delhi, 2013.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
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COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	1	2	-	-	-	-	-	-	-	2	1
CO2	3	3	2	1	2	-	-	-	-	-	-	-	3	2
CO3	3	3	3	2	3	-	-	-	-	-	2	2	3	3
CO4	3	3	2	3	2	-	-	-	-	-	1	-	3	2
CO5	3	3	3	3	3	-	-	-	-	-	2	2	3	3

MC23402	HUMAN VALUES AND GENDER EQUALITY	2	0	0	0

COURSE OBJECTIVES	
To enable the students to	
1.	define different types of human values and their impact on individual behaviour and societal norms.
2.	apply principles of personal development such as self-confidence, self-discipline, and resilience to navigate modern challenges effectively.
3.	evaluate the role of values in shaping professional ethics, civic sense and global citizenship.
4.	examine the socio-economic factors influencing gender inequality and explore avenues for empowerment and advocacy.
5.	critically analyze prevalent issues and challenges faced by women, including gender-based violence, discrimination, and cultural biases, and propose measures for their eradication.

UNIT I	HUMAN VALUES	6

Value Education - Definition, Types of values; Human values - Acceptance, Consideration. Appreciation, Listening. Empathy, Sympathy, Honesty, Integrity, Wisdom, Decision making, Self-actualization, Character formation towards positive personality, Contentment; - Religious Values - Humility, Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II	PERSONALITY DEVELOPMENT	6

Personal Development - Introspection, Self-confidence, Self-discipline; Flexibility -Peer pressure - Sensitization towards Gender Equality; Reliability; Unity; Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition, Positive and Negative attitudes; Family values; Self- improvement - Physical exercises, Meditation ,Yoga.

UNIT III	VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT	6

Professional Values -. Integrity, Responsibility, Punctuality, Dedication - Perseverance - Competence; Civic sense and Responsibility; Global Values - Computer Ethics, Moral Leadership, Code of Conduct; Corporate Social Responsibility; Aesthetic values; National Integration and International understanding of Religious Values – Spirituality, thought process.

UNIT IV	GENDER EQUALITY	6

Gender Equality - Definition, Empowerment, Economic Equality; Condition of Women in India- Education, Healthcare, Political Representation, Gender-based Violence; Challenging Stereotypes: Parental and Caregiving Responsibilities; Legal and Policy Reform; Cultural Shifts; Global Perspective; Male Chauvinism; Sustainable Development..

UNIT V	WOMEN ISSUES AND CHALLENGES	6

Women Issues and Challenges - female feticide, violence against women; Domestic violence- dowry related abuse and deaths, Physical violence, Emotional abuse; Sexual assault; Honour killing; Eve-teasing- Stalking, e-stalking (cyber-crime).

	TOTAL PERIODS	30

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	discuss the concept of human values and their significance in personal and societal development.	Understanding (K2)
CO2	demonstrate introspective skills to enhance personal growth and self-awareness.	Applying (K3)
CO3	recognize the importance of gender equality in promoting a just and equitable society.	Understanding (K2)
CO4	cultivate a sense of social responsibility and ethical conduct towards achieving national and global development.	Analyzing (K4)
CO5	analyse the challenges faced by women in various spheres and identify strategies for addressing them.	Analyzing (K4)

TEXT BOOKS

1. A Foundation Course in Human Values and Professional Ethics: Presenting a Universal Approach to Value Education - Through Self-exploration. New Delhi, 2016.
2. Aurther, John. Personality Development. Lotus Press, 2018.

REFERENCES

1. Joshi, Dhananjay. Value Education in Global Perspective. Lotus Press, 2014.
2. Mahrotra, Mamta. Gender Inequality in India: Challenging Social Norms. Prabhat Books, 2015.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
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COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	1	1	1	2	3	2	1	1	3	1	2
CO2	-	1	-	1	1	1	3	3	2	2	1	1	1	2
CO3	-	1	-	1	1	1	2	3	1	1	1	3	1	2
CO4	-	1	-	1	1	1	2	3	2	2	1	2	1	2
CO5	-	1	-	1	1	1	1	3	2	2	1	3	1	2

AD23404	COMPUTER NETWORKS	3	0	2	4

COURSE OBJECTIVES

To enable the students to

1. understand the function of different layers of OSI model.
2. know about the components required to build different types of networks.
3. study the various routing protocols operation.
4. learn the flow control and congestion control algorithms.
5. acquire knowledge of application layer and its working principles.

UNIT I	FUNDAMENTALS AND PHYSICAL LAYER	9

Introduction - Data communications, Networks, Network Types; Protocol Layering - The OSI Model, TCP/IP protocol suit; Physical Layer: Overview of Data and signals; Transmission media; Switching.

UNIT II	DATA LINK LAYER	9

Data link control - Framing, Flow Control, Error Control, HDLC; Media Access Control; Wired LANs - Standard Ethernet, Fast Ethernet, Gigabit Ethernet; Wireless LANs - IEEE 802.11, Bluetooth; Connecting Devices.

UNIT III	NETWORK LAYER	9

Logical addressing - IPv4 Addresses, IPv6Addresses; Internet protocol - Internetworking (IPv4, IPv6), Transitions from IP4 to IP6; ICMP; IGMP; Forwarding; Unicasting routing protocol; Multi casting routing protocol.

UNIT IV	TRANSPORT LAYER	9

Duties of Transport Layer; User datagram protocol (UDP); Transmission control protocol (TCP) - Connection establishment, Connection release; Congestion control; Congestion avoidance (DECbit, RED); Quality of Service - Techniques to Improve QoS.

UNIT V	APPLICATION LAYER	9

Application Layer protocols: DNS – Email protocols (SMTP - POP3 - IMAP - MIME) – FTP – WWW (HTTP, HTTPS) – SNMP

	TOTAL PERIODS	45

LIST OF EXPERIMENTS

1. Simulate the network topologies (Bus, Ring, Star and Mesh) using Cisco Packet Tracer.
2. There are 20PC's in your network. Five PC's are connected to one Ethernet hub, and five PC's are connected to another hub. Each hub is connected to separate switch and both the switches are connected to a separate router. The routers are connected via an Ethernet bridge. The remaining 10 PC's are connected directly to one of the two switches. How many Ethernet segments are there? Implement this scenario using cisco packet tracer.
3. Simulation of error correction code (like CRC).
4. Implement bit stuffing and byte stuffing using C program.
5. Write a code to implement distance vector routing algorithm.
6. Write a code to implement border gateway protocol (BGP).
7. Applications using TCP sockets like:
   a) Echo client and echo server
   b) Chat

8. Write a HTTP web client program to download a web page using TCP sockets.
9. Configure a Web server, DHCP server and a DNS server all together in a single simulation through which IP have to be allocated for the host through DHCP server, Conversion of Canonical Name to IP address to be done by DNS server and Access to the webpage has to given by web server using Cisco Packet Tracer.

	TOTAL PERIODS	75

	COURSE OUTCOMES At the end of this course, the students will be able to	BT MAPPED (Highest Level)
CO1	explain the basic layers and its functions in computer networks.	Applying (K3)
CO2	demonstrate the knowledge of flow control algorithms at data link layer.	Analyzing (K4)
CO3	apply the suitable routing algorithms for the given network.	Applying (K3)
CO4	develop a client/server application using TCP/UDP and design algorithms for end-end communication.	Applying (K3)
CO5	implement the various application layer protocols.	Analyzing (K4)

TEXT BOOKS

1. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022.
2. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Sixth Edition, Morgan Kaufmann Publishers Inc., 2019.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2014.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	1	2	-	-	-	-	-	3	1	3	-	3
CO2	2	3	3	2	-	-	-	-	1	3	1	3	2	3
CO3	3	3	2	2	-	-	-	1	1	3	1	3	2	3
CO4	3	3	3	2	-	-	-	1	1	3	1	3	2	3
CO5	3	3	3	2	3	2	-	2	1	3	1	3	3	3

AD23405	OPERATING SYSTEMS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1.	execute shell programming and the use of filters in the UNIX environment.
2.	perform programming in c using system calls and to process creation and inter process communication, demonstrate scheduling algorithms.
3.	implement file system related system calls.
4.	be familiar with implementation of CPU scheduling algorithms, page replacement algorithms and deadlock avoidance.

LIST OF EXPERIMENTS

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms.
   a) FCFS b) SJF c) Priority d) Round Robin
4. Implement the following file allocation strategies.
   b) Sequential b) Indexed c) Linked
5. Implement Semaphores.
6. Implement Bankers Algorithm for Dead Lock Avoidance and Deadlock Detection.
7. Implement the following page replacement algorithms.
   c) FIFO b) LRU c) Optimal
8. Implement Paging Technique of memory management.
9. Implement Shared memory and IPC.
10. Implement Thread and Synchronization

TOTAL PERIODS	**60**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	compare the performance of various CPU scheduling algorithms for a given applications.	Applying (K3)
CO2	implement the file allocation strategy.	Applying (K3)
CO3	implement deadlock avoidance and detection algorithms.	Applying (K3)
CO4	analyse different paging techniques for efficient memory allocation.	Applying (K3)

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(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	3	-	-	-	-	2	1	3	2	1
CO2	3	3	3	1	2	-	-	-	-	2	2	3	2	1
CO3	3	2	3	2	3			2	2	2	2	3	2	1
CO4	3	3	3	1	2	-	-	-	-	2	2	3	2	1

AD23406	DATABASE MANAGEMENT SYSTEMS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1.	explore and implement important commands in SQL with key and constraints.
2.	learn the usage of nested and joint queries.
3.	acquire the knowledge of Triggers, Views and Cursor.
4.	familiar with the use of a database Connectivity

LIST OF EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
10. Database Programming: Implicit and Explicit Cursors.
11. Database Connectivity with Front End Tools.

TOTAL PERIODS	**60**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	create SQL databases table with various key constraints	Applying (K3)
CO2	construct simple and advanced Query Techniques and Join operations	Applying (K3)
CO3	implement the Transaction Management and Trigger Implementation	Applying (K3)
CO4	develop program with Integration and Database Programming	Applying (K3)

CO-PO MAPPING:

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(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	1	2	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	3	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	3	-	-	-	1	1	-	-	3	2
CO4	3	3	3	3	3	2	-	-	2	2	1	2	3	3

GE23401	PROFESSIONAL DEVELOPMENT II	0	0	2	1

COURSE OBJECTIVES

To enable students to

1	enhance their own behavioral skills to survive in corporate world.
2	evaluate their listening and speaking skills to face the interviews in a successful way.
3	solve the quantitative aptitude problems and improve their problem-solving skills.
4	improve their reasoning skills to get placed in reputed companies

UNIT I	WRITING SKILLS	7

Email Writing - fixing and cancelling appointments, paper submission for seminars and conferences - Business communication, Stress Management - Body Language - Dress Code - Self Introduction II - Update Resume Building II - JAM Level - 3.

UNIT II	PRESENTATION SKILLS	7

Presentation Skills: Types and Methods of Delivering Presentation - Ways and Methods to improve Presentation Skills; Mini Presentation in smaller groups - Situational Role Play; Face to Face interview, Group Discussion Level II - JAM Level - 4.

UNIT III	QUANTITATIVE APTITUDE	8

Simplification - Time, Speed and Distance - Trains - Boats and Streams - Ratio and Proportion - Partnership - Percentage.

UNIT IV	LOGICAL REASONING	8

Seating Arrangement - Arithmetic Reasoning - Character Puzzle - Syllogisms - Matching - Definitions - Statements and Arguments.

TOTAL PERIODS	30

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	interpret the personality development through various activities.	Understanding (K2)
CO2	examine speaking and Listening Skills to excel in their jobs.	Analyzing (K4)
CO3	develop the quantitative skills and analytical skills to face the interview	Applying (K3)
CO4	extend the reasoning abilities by scoring exceeded percentage to get placed in reputed companies	Understanding (K2)

TEXTBOOKS

1. Agarwal, R.S. "Objective General English", S.Chand&Co., 2021.
2. Agarwal, R.S. "Quantitative Aptitude", S.Chand&Co., 2021.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill., 2023.
2. Agarwal, R.S." A Modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, newdelhi., 2021
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications., 2021.

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's)
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	Programme Outcomes (PO's)													
	P01	P02	P03	PO4	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	1
CO2	-	-	-	-	-	-	2	3	2	3	-	3	2	1
CO3	3	2	2	2	-	-	1	-	-	-	-	-	2	2
CO4	2	3	3	2	-	3	3	1	-	1	2	-	1	1