E.G.S. PILLAY ENGINEERING COLLEGE (AUTONOMOUS)
Approved by AICTE, New Delhi
(Affiliated to Anna University, Chennai | Re-accredited by NAAC with 'A++' Grade)
Accredited by NBA (Tier-1)
NAGAPATTINAM – 611002

B.E. COMPUTER SCIENCE AND ENGINERING R - 2023
SECOND YEAR

CURRICULUM AND SYLLABUS FOR THIRD SEMESTER

SEMESTER III							
Course Code	**Course Name**	**Category**	**L**	**T**	**P**	**C**	**Contact Hours**
2301MA304	Discrete Mathematics	BSC	3	1	0	**4**	4
2302CS301	Data Structures	PCC	3	1	0	**4**	4
2302CS302	Operating Systems	PCC	3	0	0	**3**	3
2302CS303	Problem Solving using Python	PCC	3	0	2	**4**	5
2302CS304	Computer Organization and Architecture	PCC	3	0	0	**3**	3
2301HSX01	Universal Human Values and Ethics	HSMC	1	0	2	**2**	3
	Laboratory course						
2302CS351	Data Structures Laboratory	PCC	0	0	2	**1**	2
2302CS352	Operating Systems Laboratory	PCC	0	0	2	**1**	2
2304GE301	Professional Development Course – I	EEC	0	0	2	**1**	2
2304LS351	Life Skills – III	MC	0	0	0	**0**	0
Total			17	2	8	**23**	27

L–Lecture |T–Tutorial |P– Practical |CA– Continuous Assessment |ES –End Semester

2301MA304	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

PREREQUISITE:

Engineering mathematics I and II

COURSE OBJECTIVES:

1. Be exposed to the concepts of ADTs
2. Learn linear data structures – list, stack, and queue.
3. Be exposed to sorting, searching, hashing algorithms
4. Learn to apply Tree and Graph structures

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Implement abstract data types and performance analysis for linear data structures
CO2:	Apply the different linear data structures to problem solutions.
CO3:	Critically analyze the various algorithms
CO4:	Have a comprehensive knowledge of Trees and their implementations
CO5:	Learn advanced data structures like Graphs and their implementation

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	-	-	-	-	2	2	2	2
CO2	2	2	3	3	2	-	-	-	2	3	3	3
CO3	2	2	3	2	1	-	-	-	2	1	1	2
CO4	1	2	3	2	-	-	-	-	3	2	3	3
CO5	1	1	3	2	1	-	-	-	2	2	2	2

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	1	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

COURSE CONTENTS:

MODULE I **SET THEORY AND LOGIC** **9+3 Hours**

Sets, function, relation, equivalence relation, Poset, Function logic, Proposition logic, Predicates and quantifiers - Nested quantifiers – Rules of inference - Proofs methods and strategy.

MODULE II **INDUCTION AND COMBINATORICS** **9+3 Hours**

Mathematical induction – In the basics of counting – The pigeon hole principle – Permutation and Combination- Solving linear recurrence relation – Generating function – Principle of inclusion exclusion.

MODULE III **GRAPH** **9+3 Hours**

Graph – Sub graphs – Operation on graph – Matrix representation of graph, path and connectedness – Graph isomorphism – Euler and Hamilton's paths and graph.

MODULE IV **ALGEBRAIC STRUCTURE** **9+3 Hours**

Algebraic system – Semi groups, Monoids, Groups , Subgroups and their properties – Cyclic groups – Cosets – Permutation groups - Lagrange‟s theorem – Cayley‟s theorem – Normal subgroups, Homomorphism of groups – Introduction to rings and fields.

MODULE V	**LATTICES AND BOOLEAN ALGEBRA**	**9+3 Hours**
Lattices aspartially order sets, properties of lattices – lattices as algebraic system some special lattices – Boolean algebra.		
		TOTAL: 45+15 HOURS

REFERENCES:

1.Ralph.p, Grimaldi – Discrete and combinatorial mathematics, An applied introduction – Fourth edition person education Asia, Delhi 2020.

2.Trembly J.P and Manohar R – Discrete mathematical structure with application to computer science, Tata MC grow hill, Delhi.

3.Peter J Cameron – combinatorics – Topics, Technique and algorithms, Cambridge University Press.

4.Nptel.ac.in/course/111105035 www.nptel videos in 2012/11/mathematics.

2302CS301	DATA STRUCTURES	L	T	P	C
		3	1	0	4

PREREQUISITE:

Programming in C.

COURSE OBJECTIVES:

1. Be exposed to the concepts of ADTs
2. Learn linear data structures – list, stack, and queue.
3. Be exposed to sorting, searching, hashing algorithms
4. Learn to apply Tree and Graph structures

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Implement abstract data types and performance analysis for linear data structures
CO2:	Apply the different linear data structures to problem solutions.
CO3:	Critically analyze the various algorithms
CO4:	Have a comprehensive knowledge of Trees and their implementations
CO5:	Learn advanced data structures like Graphs and their implementation

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	-	-	-	-	2	2	2	2
CO2	2	2	3	3	2	-	-	-	2	3	3	3
CO3	2	2	3	2	1	-	-	-	2	1	1	2
CO4	1	2	3	2	-	-	-	-	3	2	3	3
CO5	1	1	3	2	1	-	-	-	2	2	2	2

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	1	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

COURSE CONTENTS:

MODULE I	PERFORMANCE ANALYSIS AND INTRODUCTION TO DATA STRUCTURES	9+3 Hours

Performance Analysis: Algorithm definition and characteristics, time and space complexity, Asymptotic Notations – Big O, Omega and Theta Notations: Introduction, Data structure Types - Data structure operations - Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists- circularly linked lists- doubly linked lists – applications of lists – Polynomial Manipulation.

MODULE II	LINEAR DATA STRUCTURES – STACK AND QUEUE	9+3 Hours

Stack: Array implementation, Linked list implementation, Applications of stack: Infix to Postfix, Evaluation of Postfix, Balancing symbols, Nested function calls, Recursion, Towers of Hanoi.
Queue: Array implementation, Linked List implementation, Circular Queue.

MODULE III	NON LINEAR DATA STRUCTURES – TREES	9+3 Hours

General trees, Terminology, Representation of trees, Tree traversal- Binary tree, Representation, Expression

tree, Binary tree traversal, Binary Search Tree: Construction, Searching, Insertion, Deletion, AVL trees: Rotation, Insertion, Deletion, B-Trees, B + Trees, Splay trees, Red-Black Trees.		
MODULE IV	**NON LINEAR DATA STRUCTURES – GRAPHS**	**9+3 Hours**
. Representation of Graphs – Breadth-first search – Depth-first search – Topological sort – Minimum Spanning Trees – Kruskal‟s and Prim‟s algorithm – Shortest path algorithm – Dijkstra's algorithm – Bellman-Ford algorithm – Floyd - Warshall algorithm.		
MODULE V	**LINEAR DATA STRUCTURES - SORTING, SEARCHING AND HASH TECHNIQUES**	**9+3 Hours**
Sorting algorithms: Insertion sort - Selection sort - Shell sort - Bubble sort - Quick sort - Merge sort - Radix sort – Searching: Linear search –Binary Search Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing		
		TOTAL: 45+15 HOURS

REFERENCES:

1.Seymour Lipschutz, "Data Structures with C", McGraw Hill Education, Special Indian Edition, 2021.

2.A.V.Aho, J.E Hopcroft and J.D.Ullman, "Data structures and Algorithms", Pearson Education, First Edition Reprint 2023.

3.R.F.Gilberg, B.A.Forouzan, "Data Structures", Second Edition, Thomson India Edition, 2015.

4.ReemaThareja, "Data Structures Using C", Oxford Higher Education, First Edition, 2021.

2302CS302	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

PREREQUISITE:

Data structures like stack, queue, linked list, tree, graph, hashing, file structures, any structured programming language (like C or python).

COURSE OBJECTIVES:

1. To learn different types of operating systems along with the components and services provided.
2. To understand the concept of process management and implementation of process scheduling in a multi-programming environment using scheduling algorithms.
3. To provide knowledge on the structure and operations of memory management and storage management.
4. To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Analyze the evolution of operating systems, components and the usage of system calls & programs.
CO2:	Analyze the operation of processes and CPU scheduling algorithms in process management. .
CO3:	Analyze the activities involved in process synchronization and deadlock mechanism.
CO4:	Compare and contrast various memory management schemes
CO5:	Compare iOS and Android Operating Systems.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	-	1	-	-	-	-	-
CO2	2	2	3	2	2	-	2	-	-	-	-	-
CO3	2	2	3	2	2	-	2	-	-	-	-	-
CO4	2	2	3	2	2	-	2	-	-	-	-	-
CO5	3	1	2	1	1	-	-	-	-	-	-	-

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	2	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

COURSE CONTENTS:

MODULE I INTRODUCTION **9 Hours**

Components of Computer System - Evolution of Operating System. Operating System Components & Services: Process management -Memory Management- Storage Management - Protection & Security - Operating System Services. Computing Environments- Open-source operating systems -System Calls & System programs

MODULE II PROCESS MANAGEMENT **9 Hours**

Process Concepts: Process Scheduling-Scheduling Queues -Scheduler - Context Switch. Cooperating

Processes- Inter process Communication CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms, Threads - Multithread Models – Threading issues		
MODULE III	**PROCESS SYNCHRONIZATION AND DEADLOCK**	**9 Hours**
Process Synchronization: The Critical-Section Problem - Synchronization Hardware - Semaphores - Classic problems of Synchronization. Deadlock: System Model - Deadlock Characterization - Methods for handling Deadlocks -Deadlock Prevention - Deadlock avoidance - Deadlock detection - Recovery from Deadlocks.		
MODULE IV	**MEMORY AND STORAGE MANAGEMENT**	**9 Hours**
Address Binding -Contiguous Memory allocation-Fragmentation - Paging- Segmentation. Virtual Memory: Demand Paging - Page Replacement Algorithms - Allocation of Frames-Thrashing. **File Management:** Access Methods - Directory Structure- Directory Implementation - Allocation Methods Secondary Storage Structure: Disk Structure - Disk Scheduling.		
MODULE V	**VIRTUAL MACHINES AND MOBILE OS**	**9 Hours**
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.		
		TOTAL: 45 HOURS

REFERENCES:

1.RamazElmasri, A. Gil Carrick, David Levine, " Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.

2.William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.

3.AchyutS.Godbole, AtulKahate, "Operating Systems", McGraw Hill Education, 2016.

4.https://onlinecourses.nptel.ac.in/noc23_cs101/preview(Link for NPTEL/SWAYAM/MOOC Courses)

2302CS303	PROBLEM SOLVING USING PYTHON	L	T	P	C
		3	0	2	4

PREREQUISITE:

Programming in C

COURSE OBJECTIVES:

1. To learn to solve problems using Python conditionals and loops.
2. To define Python functions and use function calls to solve problems.
3. To use Python data structures – lists, tuples, dictionaries to represent complex data.
4. To do input/output with files in Python.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to.

CO1:	Develop and execute simple Python programs.
CO2:	Write simple Python programs using conditionals and looping for solving problems.
CO3:	Decompose a Python program into functions.
CO4:	Represent compound data using Python lists, tuples, dictionaries etc.
CO5:	Read and write data from/to files in Python programs.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	2	2	-	-	1
CO2	3	3	2	2	2	-	-	-	-	1	-	1
CO3	3	3	2	1	-	-	-	2	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	1	1	-
CO3	1	1	-
CO4	1	1	-
CO5	1	1	-

COURSE CONTENTS:

MODULE I **DATA TYPES, EXPRESSIONS, STATEMENTS** **9Hours**

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

MODULE II **CONTROL FLOW AND FUNCTIONS** **9 Hours**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion.

MODULE III **STRINGS, LISTS AND TUPLES** **9 Hours**

Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search. Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple

assignment, tuple as return value.		
MODULE IV	**DICTIONARIES AND FILES**	**9 Hours**
Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation. Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions.		
MODULE V	**PYTHON MODULES AND PACKAGES**	**9 Hours**
Modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation.		
		TOTAL: 45 HOURS

REFERENCES:

1.Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2.G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.

3.John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data'', Third Edition, MIT Press, 2021

4.https://nptel.ac.in/courses/106106182.

2302CS304	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

PREREQUISITE:

Introduction to Computer, Programming in C

COURSE OBJECTIVES:

1. Working of Computer Systems and basic principles
2. Instruction Level Architecture and Instruction Execution
3. The current state of art in memory system design
4. Accessing I/O devices and its principles.
5. To provide the knowledge on Instruction Level Parallelism

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Learn the concepts of computer organization for several engineering applications.
CO2:	Develop the ability and confidence to use the fundamentals of computer organization as a tool in the engineering of digital systems.
CO3:	An ability to identify, formulate, and solve hardware and software computer engineering problems using sound computer engineering principle
CO4:	To impart the knowledge on micro programming
CO5:	Comprehend the concepts of advanced pipelining techniques

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	-	-	-	-	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1
CO4	2	1	1	-	-	-	-	-	-	-	-	1
CO5	2	1	1	-	-	-	-	-	-	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	2	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

COURSE CONTENTS:

MODULE I **BASIC FUNCTIONAL UNITS OF COMPUTERS** **9 Hours**

Functional units, basic Operational concepts, Bus structures. Software, Performance, Multiprocessors, Multicomputer. Data Representation: Signed number representation, fixed and floating point Representations**.**

MODULE II **REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS** **9 Hours**

RTL- Registers, Register transfers, Bus and memory transfers. Micro operations: Arithmetic, Logic, and Shift micro operations, Arithmetic logic shift unit. Basic Computer Organization and Design: Computer Registers, Computer instructions, Instruction cycle. Instruction codes, Timing and Control, Types of

Instructions: Memory Reference Instructions, Input – Output and Interrupts		
MODULE III	**CENTRAL PROCESSING UNIT ORGANIZATION**	**9 Hours**
General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors Control unit design: Design approaches, Control memory, Address sequencing, Micro Programmed Control.		
MODULE IV	**MEMORY ORGANIZATION**	**9 Hours**
Semiconductor Memory Technologies, Memory hierarchy, Interleaving, Main Memory-RAM and ROM chips, Address map, Associative memory-Hardware organization. Match logic. Cache memory-size vs. block size, Mapping functions-Associate, Direct, Set Associative mapping. Replacement algorithms, write policies. Auxiliary memory-Magnetic tapes.		
MODULE V	**VECTOR PROCESSING AND I/O ORGANIZATION**	**9 Hours**
Pipelining Basic concepts, Instruction level Parallelism and challenges, Throughput and Speedup, Pipeline hazards. Peripheral devices, Input-output subsystems, I/O device interface, I/O Processor, I/O transfers– Program controlled, Interrupt driven, and DMA, interrupts and exceptions. I/O device interfaces – SCII, USB		
		TOTAL: 45 HOURS
REFERENCES:		
1.Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI 3rd Edition June 2017.		
2.Computer Architecture and Organization", 3rd Edition by John P. Hayes,WCB/McGraw- Hill, 2017		
3.Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill 2011.		
4.Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F.Jordan, Pearson Education 2008.		

2301HSX01	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		1	0	2	2

PREREQUISITE:

	Professional Ethics

COURSE OBJECTIVES:

	1. Reinstate India's rich cultural legacy and human values of which we are the custodians.
	2. Focus on professional ethics, which help citizens to discern desirable and undesirable actions.
	3. Re-emphasize constitutional values, universal values, and holistic education to create integrated citizens.
	4. Lay down broader guidelines of human values and ethics for internal and external stakeholders.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Create such an environment, it is essential to ensure the inclusion of the learning process for holistic development.
CO2:	Create such an environment, it is essential to ensure the inclusion of impeccable governance.
CO3:	Create such an environment, it is essential to ensure the inclusion of effective institutional management.
CO4:	Create such an environment, it is essential to ensure the inclusion of well-laid system of rewards and reprimand.
CO5:	Create such an environment, it is essential to ensure the inclusion of institutional climate where "rights" are encouraged and "wrongs" are discouraged.
CO6:	Create such an environment, it is essential to ensure the inclusion of inward-looking groups and communities that have the potential to develop the capacity of individuals, source their potential and universal values, and ensure that their actions enable justice and equity to all.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	-	1	1	3	1	-	-	1
CO2	2	1	2	-	-	1	2	2	1	-	-	1
CO3	2	1	2	-	-	1	1	2	1	-	-	1
CO4	2	1	2	-	-	1	1	2	1	-	-	1
CO5	2	1	2	-	-	1	2	3	1	-	-	1
CO6	2	1	2	-	-	1	2	2	2	-	-	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	3	-
CO3	3	3	-
CO4	3	3	-
CO5	3	3	-

COURSE CONTENTS:

MODULE I	**INTRODUCTION TO INDIAN ETHOS**	**8 Hours**
Meaning of ethos and cultural essence of India – Scriptures as the base of the Indian Knowledge System (IKS) – Integrating the two methodologies: interiorization process for self-exploration, and exterior scientific pursuit for the prosperity of world – The Law of Karma and Nish kama Karma (The Law of action and selfless action). **Practical**: Five hours of Yoga practice per week, Ethics through Music and Indian Poetry, Community Engagement.		
MODULE II	**HUMAN VALUES AND ETHICS**	**9 Hours**
Knowing the Self and the universal values that we stand for - This is self enquiry& self discovery– Background conversations and deep listening - recognizing the assumptions that we make - the biases we have - and the implications for ethical action –Self-identity: distinguishing and embracing oneself (and others) four profiles (inner-potential, social, professional, personality)–Distinguish ideology, perspectives beliefs from embodying values. **Practical:**Self discovery, self enquiry and Mindfulness, Yama & Niyama of Ashthang Yoga.		
MODULE III	**CONSTITUTIONAL VALUES AND GLOBAL CITIZENSHIP**	**9 Hours**
Values embedded in the Preamble of the Indian Constitution Integration of Human Rights and duties – Directive principles and responsibilities as citizens of India – Sensibility and responsibilities towards global environment, Loksangraha and Vasudhaiva Kutumbakam. **Practical:** Debates and Theatre on diversity and plurality, research on similarities and differences in the ethos of different countries.		
MODULE IV	**VALUES AND SKILLS FOR YOUTH**	**9 Hours**
Designing to make a difference through strategies using the Conscious Full Spectrum Response model – Listening for commitment behind complaints to transform contentious arguments and create a space for listening and change – Distinguishing judgement from discernment – Being assertive and confident (assertiveness incorporates self-confidence). **Practical :** Development of concentration among students through music, fine arts, mathematics, sports, yoga and mindfulness		
MODULE V	**INTEGRATED PERSONALITY AND WELL-BEING**	**10 Hours**
The three gunas (qualities of sattva—purity and harmony, rajas —activity and passion, tamas —darkness and chaos), the four antah-karanas (inner instruments), and panchkosha (five sheaths) – Stress management: meditated personality and agitated personality – Oneness, non-duality, and equanimity – Physical, mental, social, and spiritual well-being. **Practical :** Talks on importance of the Ayurvedic concept of well being and nutrition,sports activities		
		TOTAL: 45 HOURS

REFERENCES:

1. Blanchard, Kenneth and Peale, Norman Vincent. 1988. The Power of Ethical Management. New York: William Morrow and Company, Inc.

2. Gandhi, Mohandas Karamchand. 1971. Pathway to God compiled by MS Deshpande. Ahmedabad: Navajivan Mudranalaya, Navjivan Trust.

3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php.

2302CS351	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE:

Programming in C

COURSE OBJECTIVES:

1. Be exposed to implementing abstract data types
2. Learn to implement sorting and searching algorithms.
3. Getting exposure in implementing the different data structures

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Design and implement C programs for implementing stacks, queues, linked lists.
CO2:	Implement stack applications.
CO3:	Develop searching and sorting programs.
CO4:	Apply the different data structures for implementing solutions to practical problems.
CO5:	Develop recursive programs using trees and graphs

COs Vs POs MAPPING:

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

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	1	2	-
CO2	1	2	-
CO3	2	2	-
CO4	2	2	-
CO5	3	3	-

LIST OF EXPERIMENTS:

1. Array implementation of List ADT
2. Array implementation of Stack and Queue ADTs
3. Linked list implementation of List, Stack and Queue ADTs
4. Conversion of infix expressions to postfix and evaluation of postfix expressions.
5. Implementation of priority queue
6. Implementation of Sorting algorithms : Insertion Sort, Quick Sort, Merge Sort
7. Implementation of searching techniques
8. Write a program to Implement Binary Search Tree
9. Write a program to Implement Tree traversal Techniques
10. Write a program to Implement Minimum Spanning Tree using Prims and Kruskal Algorithm.
11. Write a program to Implement Shortest Path using Dijkstra‟s algorithm.
12. Implementation of Hashing – any two collision techniques

TOTAL: 45 HOURS
REFERENCES:
1.*www.cs.cf.ac.uk/Dave/C/*
2.*http://www.lysator.liu.se/c/bwk-tutor.html*
3.*http://en.wikibooks.org/wiki/Data_Structures/Introduction*
4.*http://www.eskimo.com/~scs/cclass/notes/top.html*

2302CS352	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE:

There is no prerequisite for the course

COURSE OBJECTIVES:

1. To understand the basics of Unix command and shell programming.
2. To implement the concepts of process management and synchronization
3. To implement the concepts of Memory and Storage Management

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1:	Define and implement UNIX Commands
CO2:	Compare the performance of various CPU Scheduling Algorithms.
CO3:	Compare and contrast various Memory Allocation Methods
CO4:	Define File Organization and File Allocation Strategies.
CO5:	Implement various Disk Scheduling Algorithms

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	1	-	-	-	1	3	3	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1
CO3	3	3	2	1	2	-	-	-	3	3	1	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	2	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

LIST OF EXPERIMENTS:

1. Illustrate UNIX commands and Shell Programming
2. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close
3. Write C programs to implement the various CPU Scheduling Algorithms
4. Illustrate the inter process communication strategy
5. Implement mutual exclusion by Semaphore
6. Write C programs to avoid Deadlock using Banker's Algorithm
7. Implement the paging Technique using C program
8. Write C programs to implement the following Memory Allocation Methods
   a. First Fit b. Worst Fit c. Best Fit
9. Write C programs to implement the various Page Replacement Algorithms
10. Implement the following File Allocation Strategies using C programs
    a. Sequential b. Indexed c. Linked

11. Write C programs for the implementation of various disk scheduling algorithms
12. Install any guest operating system like Linux using VMware.
TOTAL: 45 HOURS
REFERENCES:
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