Department of Engineering Mathematics & Computing

Faculty Details

Name of the Faculty: **Dr. Atul Kumar Ray**
Designation: Assistant Professor
Department: Engineering Mathematics & Computing

Course Details

Name of the Program: B.Tech. in Mathematics & Computing, July-Dec. 2024
Branch: Engineering Mathematics and Computing
Semester: Second Year (Third Semester)
Title of the Subject: Stochastic Process and Financial Mathematics
Subject Code: 3250321
Number of Students: 78

Guidelines to study the subject:

1. Basic concepts of probability and distributions.
2. Fundamental knowledge of Markov process
3. Basic knowledge of stocks
4. Basic knowledge of financial mathematics.

Recommended Books:

R1. T. Veerarajan: Probability, Statistics and Random Processes, McGraw Hill, 3rd Edition 2008.
R2. Marek Capinski and Tomasz Zastawniak, "Mathematics for Finance", Springer (201 1).
R3. Kannoo Ravindran, The Mathematics of Financial Models: Solving Real-World Problems with Quantitative Methods, Wiley Finance, (2014)

LECTURE PLAN (3250321)

S. No.	Date	Content to be covered	COs	Blooms Level (BL)	% coverage (based on the total syllabus)	Book(s) followed
		Unit-1: Fourier Series and Laplace Transform				
1		Two dimensional random variables	1	1,2	2.5%	R1
2		Cumulative distribution function	1	1,2	2.5%	R1
3		Joint probability distribution	1	2,3	2.5%	R1
4		Marginal probability distribution,	1	1,2,3	2.5%	R1
5		Basic concept of stochastic process, Markov Chain	1	2,3	2.5%	R1
6		classification of states and chain	1	1,2,3	2.5%	R1
7		Poisson process	1	2,3	2.5%	R1
8		Transient state	1	2,3,4	2.5%	R1
		Unit 2: Second order differential equations				
9		Markov process	2	1,2	2.5%	R1
10		Markov process with continuous state space	2	1	2.5%	R1
11		Markov process with discrete state space	2	1,2,3	2.5%	R1
12		Birth & Death process	2	2,3	2.5%	R1
13		Random Walks	2	2,3	2.5%	R1
14		Wiener process	2	2,3	2.5%	R1
15		Kolmogorov equation	2	1,2	2.5%	R1
16		Pollaczek-Khinchine formula	2	2,3,4	2.5%	R1
		Unit 3: Partial differential equations				

17		Basic Notions and Assumptions,	3	1,2	2.5%	R2, R3
18		No-Arbitrage Principle,	3	1,2	2.5%	R2, R3
19		One-Step Binomial Model,	3	1,2,3	2.5%	R2, R3
20		Risk and Return,	3	2,3	2.5%	R2, R3
21		Forward Contracts,	3	1,2	2.5%	R2, R3
22		Call and Put Options	3	2,3,4	2.5%	R2, R3
23		Growth and decay curves, Managing Risk with Options,	3	2,3,4	2.5%	R2, R3
24		Credit and loan, Cost of credit and amortization	3	2,3	2.5%	R2, R3
		Unit 4: Vector Calculus				
25		Time Value Of Money, Simple Interest,	4	1,2	2.5%	R2, R3
26		Periodic Compounding Streams of Payments	4	1,2	2.5%	R2, R3
27		Discrete and Continuous Compounding	4	1,2	2.5%	R2, R3
28		how to Compare Compounding Methods	4	1,2,3,4	2.5%	R2, R3
29		Money Market	4	2,3	2.5%	R2, R3
30		Discrete Time Model: Stock and Money Market Models	4	1,2,3	2.5%	R2, R3
31		Investment Strategies, The Principle of No Arbitrage	4	2,3,4	2.5%	R2, R3
32		Fundarnental Theorem of Asset Pricing	4	1,2,3	2.5%	R2, R3
		Unit 5: Discrete Numeric function and Recurrence relation				
33		Dynamics of Stock Prices	5	1,2	2.5%	R2, R3
34		Expected Return	5	1,2	2.5%	R2, R3
35		Binomial Tree Model	5	2,3	2.5%	R2, R3
36		Risk-Neutral Probability, Martingale Property	5	2,3	2.5%	R2, R3
37		Numerical Techniques in Finance: Continuous-Time Limit	5	1,2,3	2.5%	R2, R3
38		Monte-Carlo methods	5	1,2,3	2.5%	R2, R3
39		Lattice Method	5	2,3,4	2.5%	R2, R3
40		Portfolio Management: Risk and Expected Return on a Portfolio	5	2,3,4	2.5%	R2, R3
TOTAL LECTURES= 40						

Modes of Teaching

Subject: Stochastic Process and Financial Mathematics (3**250321**)- Third Semester
Name of the Program: B.Tech. in Mathematics & Computing, **July-Dec. 2024**

UNIT	CONTENT	MODE
Unit-1	Two dimensional random variables	Offline / Black Board Teaching
	Cumulative distribution function	Offline & Open discussions
	Joint probability distribution	Offline & activity based learning
	Marginal probability distribution,	Offline / Black Board Teaching
	Basic concept of stochastic process, Markov Chain	Offline / Black Board Teaching
	classification of states and chain	Teaching through demonstration by students
	Poisson process	Teaching through video lecture
	Transient state	Group based Learning
Unit-2	Markov process	Offline / Black Board Teaching
	Markov process with continuous state space	Teaching through video lecture
	Markov process with discrete state space	Offline / Black Board Teaching
	Birth & Death process	Offline & project based learning
	Random Walks	Offline & activity based learning
	Wiener process	Teaching through demonstration by students
	Kolmogorov equation	Offline / Black Board Teaching
	Pollaczek-Khinchine formula	Offline & activity based learning
Unit-3	Basic Notions and Assumptions,	Offline / Black Board Teaching
	No-Arbitrage Principle,	Offline & activity based learning
	One-Step Binomial Model,	Offline / Black Board Teaching
	Risk and Return,	Group based Learning
	Forward Contracts,	Teaching through demonstration by students
	Call and Put Options	Offline / Black Board Teaching
	Growth and decay curves, Managing Risk with Options,	Offline & project based learning
	Credit and loan, Cost of credit and amortization	Offline & Open discussions
Unit-4	Time Value Of Money, Simple Interest,	Offline & activity based learning
	Periodic Compounding Streams of Payments	Offline / Black Board Teaching
	Discrete and Continuous Compounding	Learning through demonstration
	how to Compare Compounding Methods	Offline / Black Board Teaching
	Money Market	Group based Learning
	Discrete Time Model: Stock and Money Market Models	Activity based Learning

	Investment Strategies, The Principle of No Arbitrage	Offline / Black Board Teaching
	Fundarnental Theorem of Asset Pricing	Teaching through demonstration by students
Unit-5	Dynamics of Stock Prices	Offline / Black Board Teaching
	Expected Return	Group based Learning
	Binomial Tree Model	Offline / Black Board Teaching
	Risk-Neutral Probability, Martingale Property	Offline & activity based learning
	Numerical Techniques in Finance: Continuous-Time Limit	Teaching through video lecture
	Monte-Carlo methods	Offline / Black Board Teaching
	Lattice Method	Teaching through demonstration by students
	Portfolio Management: Risk and Expected Return on a Portfolio	Offline / Black Board Teaching

Online	Offline						
	Black Board Teaching	Group based Learning	Learning through projects	Learning through demonstration	Learning through experimentation	Activity based Learning	Onsite/field based learning
14.5%	47.50%	15.0%	7.5%	10.5%	-	5.00%	-

Department of Mathematics & Computing, MITS, Gwalior

Faculties Details

Name of the Faculty: **Dr. D K Jain**
Designation: Professor (Mathematics)
Department: Engineering Mathematics & Computing

Course Details

Name of the Program: B.Tech. in Mathematics & Computing, July-Dec. 2024
Branch: Mathematics & Computing
Semester: Second Year (Third Semester)
Title of the Subject: Discrete Mathematical Structures **Subject Code**: 3250322
Number of Students: 78

Guidelines to study the subject:

5. Scientific calculator is required.
6. Fundamental knowledge of set theory and its cardinality
7. Basic knowledge of graph theory
8. Basic knowledge of difference equation and its order and degree.

Recommended Books:

R1. J.P Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science.
R2. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science.
R3: C.L. Liu: Discrete Mathematics.

LECTURE PLAN (3250322)

S. No.	Date	Content to be covered	COs	Blooms Level (BL)	% coverage (based on the total syllabus)	Book(s) followed
		Unit-1: Sets, Relations and Functions				
1		Introduction of Sets, Subsets and Power sets	1	1,2	2.5%	R1
2		Complement, Union and Intersection of sets	1	1,2	2.5%	R1
3		Demorgan's law of sets and Cartesian product of two sets	1	2,3	2.5%	R1
4		Relations, relational matrices, properties of relations,	1	1,2,3	2.5%	R1
5		Equivalence relation and their problems	1	2,3	2.5%	R1
6		Definition of functions, Injection, Surjection and Bijective mapping and its properties	1	1,2,3	2.5%	R1
7		Composition of functions, Permutations and the characteristic functions	1	2,3	2.5%	R1
8		Method of Mathematical induction	1	2,3,4	2.5%	R1
		Unit 2: Lattices				
9		Definition of Partial order set/Po-set	2	1,2	2.5%	R1
10		Determination of Upper bounds, lower bounds, Maximal and minimal element of a set	2	1	2.5%	R1
11		Definition of Lattices and sub lattices and its properties	2	1,2,3	2.5%	R1
12		To construct Hasse diagrams of lattice	2	2,3	2.5%	R1
13		Isotonicity and distributive inequality of lattice	2	2,3	2.5%	R1
14		Lattice homomorphism and lattice isomorphism	2	2,3	2.5%	R1
15		complete lattice and complemented lattice	2	2,3,4	2.5%	R1
16		distribution lattice and its theorem	2	2,3,4	2.5%	R1
		Unit 3: Graphs				

17		Introduction of graph and Operation of graphs (Union, Intersection, complement, product and composition)	3	1,2	2.5%	R2, R3
18		Sub graph and Fusion of graphs	3	1,2	2.5%	R2, R3
19		Planer graphs, Region of graph and proof of Euler's formula,	3	1,2,3	2.5%	R2, R3
20		connected graph, Brook's theorem and directed graphs	3	2,3	2.5%	R2, R3
21		Types of directed graphs, Digraphs and binary relations of graph	3	1,2	2.5%	R2, R3
22		Euler graphs, Hamiltonian paths, Walks and circuits	3	2,3,4	2.5%	R2, R3
23		Graph colouring (vertex colouring), Chromatic Number, upper bound and lower bound of chromatic number	3	2,3,4	2.5%	R2, R3
24		Network flows and Matrix representation of graph	3	2,3	2.5%	R2, R3
		Unit 4: Trees				
25		Definition of Trees – Rooted and binary trees and its Properties	4	1,2	2.5%	R2, R3
26		To find Distance and centres in tree	4	1,2	2.5%	R2, R3
27		Spanning trees, Binary Search tree	4	1,2	2.5%	R2, R3
28		Spanning trees in a weighted graph and minimal spanning tree	4	1,2,3,4	2.5%	R2, R3
29		Connectivity and separability	4	2,3	2.5%	R2, R3
30		Network flows, and cut sets	4	1,2,3	2.5%	R2, R3
31		Properties of cut set, and some theorems	4	2,3,4	2.5%	R2, R3
32		Fundamental circuits and cut sets	4	1,2,3	2.5%	R2, R3
		Unit 5: Discrete Numeric function and Recurrence relation				
33		Introduction to discrete numeric functions (DNF) and generating functions,	5	1,2	2.5%	R3
34		Introduction to recurrence relations and recursive algorithms	5	1,2	2.5%	R3
35		Determination of Generating from DNF	5	2,3	2.5%	R3
36		Determination of DNF from Generating	5	2,3	2.5%	R3
37		To find homogeneous solutions of linear recurrence relations with constant coefficients	5	1,2,3	2.5%	R3
38		To find particular solutions of linear recurrence relations with constant coefficients	5	1,2,3	2.5%	R3
39		To find total solutions of linear recurrence relations with constant coefficients	5	2,3,4	2.5%	R3
40		To find total solutions by using Generating function	5	2,3,4	2.5%	R3
TOTAL LECTURES= 40						

Modes of Teaching

Subject: Discrete Mathematical Structures (3**250322**)-Third Semester
Name of the Program: B.Tech. in Mathematics & Computing, **July-Dec. 2024**

UNIT	CONTENT	MODE
Unit-1	Introduction of Sets, Subsets and Power sets	Offline / Black Board Teaching
	Complement, Union and Intersection of sets	Offline & Open discussions
	Demorgan's law of sets and Cartesian product of two sets	Offline & activity based learning
	Relations, relational matrices, properties of relations	Offline / Black Board Teaching
	Equivalence relation and their problems	Offline / Black Board Teaching
	Definition of functions, Injection, Surjection and Bijective mapping and its properties	Teaching through demonstration by students
	Composition of functions, Permutations and the characteristic functions	Teaching through video lecture
	Method of Mathematical induction	Group based Learning
Unit-2	Definition of Partial order set/Po-set	Offline / Black Board Teaching
	Determination of Upper bounds, lower bounds, Maximal and minimal element of a set	Teaching through video lecture
	Definition of Lattices and sub lattices and its properties	Offline / Black Board Teaching
	To construct Hasse diagrams of lattice	Offline & project based learning
	Isotonicity and distributive inequality of lattice	Offline & activity based learning
	Lattice homomorphism and lattice isomorphism	Teaching through demonstration by students
	complete lattice and complemented lattice	Offline / Black Board Teaching
	distribution lattice and its theorem	Offline & activity based learning
Unit-3	Introduction of graph and Operation of graphs (Union, Intersection, complement, product and composition)	Offline / Black Board Teaching
	Sub graph and Fusion of graphs	Offline & activity based learning
	Planer graphs, Region of graph and proof of Euler's formula	Offline / Black Board Teaching
	Connected graph, Brook's theorem and directed graphs	Group based Learning
	Types of directed graphs, Digraphs and binary relations of graph	Teaching through demonstration by students
	Euler graphs, Hamiltonian paths, Walks and circuits	Offline / Black Board Teaching
	Graph colouring (vertex colouring), Chromatic Number, upper bound and lower bound of chromatic number	Offline & project based learning
	Network flows and Matrix representation of graph	Offline & Open discussions
Unit-4	Definition of Trees – Rooted and binary trees and its Properties	Offline & activity based learning
	To find Distance and centres in tree	Offline / Black Board Teaching
	Spanning trees, Binary Search tree	Learning through demonstration
	Spanning trees in a weighted graph and minimal spanning tree	Offline / Black Board Teaching
	Connectivity and separability	Group based Learning

	Network flows, and cut sets	Activity based Learning
	Properties of cut set, and some theorems	Offline / Black Board Teaching
	Fundamental circuits and cut sets	Teaching through demonstration by students
Unit-5	Introduction to discrete numeric functions (DNF) and generating functions,	Offline / Black Board Teaching
	Introduction to recurrence relations and recursive algorithms	Group based Learning
	Determination of Generating from DNF	Offline / Black Board Teaching
	Determination of DNF from Generating	Offline & activity based learning
	To find homogeneous solutions of linear recurrence relations with constant coefficients	Teaching through video lecture
	To find particular solutions of linear recurrence relations with constant coefficients	Offline / Black Board Teaching
	To find total solutions of linear recurrence relations with constant coefficients	Teaching through demonstration by students
	To find total solutions by using Generating function	Offline / Black Board Teaching

Online	Offline						
	Black Board Teaching	Group based Learning	Learning through projects	Learning through demonstration	Learning through experimentation	Activity based Learning	Onsite/field based learning
14.5%	47.50%	15.0%	7.5%	10.5%	-	5.00%	-

Department of Mathematics & Computing, MITS, Gwalior

Faculty Details

Name of the Faculty: **Ms. Manali Singh**
Designation: Assistant professor
Department: Department of Computer Science and Business Systems

Course Details

Name of the Program: B.Tech. in Mathematics & Computing, July-Dec. 2024
Branch: Mathematics & Computing
Semester: Second Year (Third Semester)
Title of the Subject: Operating System Concepts **Subject Code**: 3250323
Number of Students: 78

Guidelines to study the subject:

1. Understand core concepts like processes, threads, and memory management.
2. Practice with real-world operating systems to reinforce learning.
3. Study key algorithms for scheduling, synchronization, and deadlock avoidance.
4. Use diagrams and flowcharts to visualize complex processes and data structures.

Recommended Books:

R1. Silberschatz, Galvin: Operating System Concepts, Wiley, 9/E, 2013.
R2. Stalling William: Operating Systems, Pearson Education, 5/E, 2006.
R3. Andrew S. Tanenbaum: Modern Operating Systems, 3/E, PHI, 2006.

LECTURE PLAN (2250524)

S. No.	Date	Content to be covered	COs	Blooms Level (BL)	% coverage (based on the total syllabus)	Book(s) followed
		Unit-1				
1		Introduction: Evolution of operating systems	1	1,2	2.5%	R1
2		Types of operating systems	1	1,2	2.5%	R1
3		Different views of operating system	1	2,3	2.5%	R1
4		Operating system concepts and structure	1	1,2	2.5%	R1
5		The Process Concept	1	2,3	2.5%	R1
6		Systems programmer's view of processes	1	1,2,3	2.5%	R1
7		Operating System Services for processes management	1	1,2	2.5%	R1
8		Scheduling algorithms	1	1,2,3	2.5%	R1
9		Performance evaluation	1	1,2	2.5%	R1
		Unit 2				
10		Memory Management: Memory management without swapping or paging	2	1,2	2.5%	R1
11		Swapping	2	1,2	2.5%	R1
12		Virtual memory	2	1,2	2.5%	R1
13		Page replacement algorithms	2	1,2	2.5%	R1
14		Modelling paging algorithms	2	1,2	2.5%	R1
15		Design issues for paging system	2	1,2	2.5%	R1
16		Segmentation	2	1,2	2.5%	R1
17		Thrashing	2	1,2	2.5%	R1
		Unit 3				

18		Interprocess communication and Synchronization: The need for interprocess synchronization	3	1,2	2.5%	R2, R3
19		Mutual exclusion	3	1,2	2.5%	R2, R3
20		Semaphores	3	1,2	2.5%	R2, R3
21		Hardware support for mutual exclusion	3	1,2	2.5%	R2, R3
22		Queuing implementation of semaphores	3	1,2	2.5%	R2, R3
23		Classical problems in concurrent programming	3	1,2	2.5%	R2, R3
24		Critical region and conditional critical region	3	1,2	2.5%	R2, R3
25		Monitors messages	3	1,2	2.5%	R2, R3
26		Deadlocks: Deadlock prevention	3	1,2,3	2.5%	R2, R3
27		deadlock avoidance	3	2,3	2.5%	R2, R3
		Unit 4				
28		Mass Storage System_ Overview of Mass Storage Structure	4	1,2	2.5%	R2, R3
29		Disk Structure	4	1,2	2.5%	R2, R3
30		Disk Scheduling and Management	4	1,2	2.5%	R2, R3
31		swap space management	4	1,2	2.5%	R2, R3
32		File-System Interface _ File concept	4	1,2	2.5%	R2, R3
33		Access methods	4	1,2	2.5%	R2, R3
34		Directory Structure	4	1,2	2.5%	R2, R3
35		Directory organization	4	1,2	2.5%	R2, R3
36		File system mounting	4	1,2	2.5%	R2, R3
37		File Sharing and Protection	4	1,2	2.5%	R2, R3
38		File System Implementation	4	1,2	2.5%	R2, R3
39		Filé System Structure	4	1,2	2.5%	R2, R3
40		Directory implementation	4	1,2	2.5%	R2, R3
41		Allocation Methods	4	2,3	2.5%	R2, R3
42		Free Space Management	4	1,2,3	2.5%	R2, R3
43		Efficiency and Performance	4	2,3,4	2.5%	R2, R3
44		Recovery	4	1,2,3	2.5%	R2, R3
		Unit 5				
45		Performance measurement: Monitoring and evaluation introduction	5	1,2	2.5%	R3
46		Important trends affecting performance issues	5	1,2	2.5%	R3
47		Why performance monitoring and evaluation are needed	5	1,2	2.5%	R3
48		Performance measures	5	1,2	2.5%	R3
49		Evaluation techniques	5	1,2	2.5%	R3
50		Bottlenecks and saturation	5	1,2	2.5%	R3
51		Feedback loops	5	1,2	2.5%	R3
52		Raid model	5	1,2	2.5%	R3
53		Case study: Unix Operating System	5	1,2	2.5%	R3
TOTAL LECTURES= 53						

Modes of Teaching

Subject: Operating System Concepts (3250323)-Third Semester
Name of the Program: B.Tech. in Mathematics & Computing, **July-Dec. 2024**

UNIT	CONTENT	MODE
Unit-1	Introduction: Evolution of operating systems	Offline / Black Board Teaching
	Types of operating systems	Offline & Open discussions
	Different views of operating system	Offline / Black Board Teaching
	Operating system concepts and structure	Offline / Black Board Teaching
	The Process Concept	Offline / Black Board Teaching
	Systems programmer's view of processes	Offline & activity-based learning
	Operating System Services for processes management	Offline / Black Board Teaching
	Scheduling algorithms	Offline / Black Board Teaching
	Performance evaluation	Offline / Black Board Teaching
Unit-2	Memory Management: Memory management without swapping or paging	Offline / Black Board Teaching
	Swapping	Offline / Black Board Teaching
	Virtual memory	Offline / Black Board Teaching
	Page replacement algorithms	Offline / Black Board Teaching
	Modelling paging algorithms	Offline & activity-based learning
	Design issues for paging system	Offline / Black Board Teaching
	Segmentation	Offline / Black Board Teaching
	Thrashing	Offline & activity-based learning
Unit-3	Interprocess communication and Synchronization: The need for interprocess synchronization	Offline / Black Board Teaching
	Mutual exclusion	Offline & activity-based learning
	Semaphores	Offline / Black Board Teaching
	Hardware support for mutual exclusion	Offline & Open discussions
	Queuing implementation of semaphores	Offline / Black Board Teaching
	Classical problems in concurrent programming	Offline / Black Board Teaching
	Critical region and conditional critical region	Offline / Black Board Teaching
	Monitors messages	Offline & activity-based learning
	Deadlocks: Deadlock prevention	Offline / Black Board Teaching
	deadlock avoidance	Offline / Black Board Teaching
	Mass Storage System_ Overview of Mass Storage Structure	Offline & activity-based learning
	Disk Structure	Offline / Black Board Teaching
	Disk Scheduling and Management	Learning through demonstration

Unit-4	swap space management	Offline / Black Board Teaching
	File-System Interface _ File concept	Offline / Black Board Teaching
	Access methods	Offline / Black Board Teaching
	Directory Structure	Offline / Black Board Teaching
	Directory organization	Offline & activity-based learning
	File system mounting	Offline / Black Board Teaching
	File Sharing and Protection	Offline / Black Board Teaching
	File System Implementation	Offline & activity-based learning
	Filé System Structure	Offline / Black Board Teaching
	Directory implementation	Offline / Black Board Teaching
	Allocation Methods	Offline / Black Board Teaching
	Free Space Management	Activity based Learning
	Efficiency and Performance	Offline / Black Board Teaching
	Recovery	Teaching through demonstration by students
Unit-5	Performance measurement: Monitoring and evaluation introduction	Offline / Black Board Teaching
	Important trends affecting performance issues	Group based Learning
	Why performance monitoring and evaluation are needed	Offline / Black Board Teaching
	Performance measures	Offline / Black Board Teaching
	Evaluation techniques	Offline / Black Board Teaching
	Bottlenecks and saturation	Offline / Black Board Teaching
	Feedback loops	Offline / Black Board Teaching
	Raid model	Offline / Black Board Teaching
	Case study: Unix Operating System	Offline & activity-based learning

Online	Offline						
	Black Board Teaching	Group based Learning	Learning through projects	Learning through demonstration	Learning through experimentation	Activity based Learning	Onsite/field-based learning
-	71.69%	1.88%	-	1.88%	-	16.98%	-

Department of Engineering Mathematics & Computing

Faculty Details

Name of the Faculty: **Prof. Prabhakar Sharma**
Designation: Assistant professor (SG)
Department: Department of Computer Science and Engineering

Course Details

Name of the Program: B.Tech. in Mathematics & Computing, July-Dec. 2024
Branch: Mathematics & Computing
Semester: Second Year (Third Semester)
Title of the Subject: Data Structure & Algorithms **Subject Code**: 3250324
Number of Students: 78

Modes of Teaching Subject: Data Structures & Algorithms (3250324)

UNIT	CONTENT	MODE
Unit-1	Array, Pointer, Recursion	Online mode
	Stack and Operations	Offline / Black Board Teaching
	Polish Representation	Online Mode
	Linear and Circular Queue	Learning through experimentation
	Dequeue, Priority Queue	Activity based Learning
Unit-2	General List	Online mode
	Contiguous Implementation of General List	Offline / Black Board Teaching
	Singly Linked List and Operations on it	Offline / Black Board Teaching
	Doubly Linked List and Operations on it	Learning through experimentation
	Circular List and Operations on it	Group based Learning
	Polynomial Representation, Josephus Problem	Learning through projects
Unit-3	Tree types, Terminology, Definitions	Online
	Tree Traversals	Offline / Black Board Teaching
	Binary Search Tree and its implementation	Offline / Black Board Teaching
	Operations on Binary Search tree	Offline / Black Board Teaching
	AVL tree, B and B+ Trees	Learning through experimentation
Unit-4	Searching and Searching Algorithms	Online
	Sorting and Sorting Algorithms	Offline / Black Board Teaching
	Hashing, Collision and its Handling	Learning through projects
	Graphs, terminology	Online
	Graph representation	Offline / Black Board Teaching
	Graph traversal	Offline / Black Board Teaching

Unit-5	Spanning Tree and Algorithms	Activity based Learning
	Shortest Path Algorithms	Learning Through Demonstration
	Sparse Matrix	Group based Learning

Online	Offline						
	Black Board Teaching	Group based Learning	Learning through projects	Learning through demonstration	Learning through experimentation	Activity based Learning	Onsite/field based learning
24%	36%	8%	8%	4%	12%	8%	-

LECTURE PLAN

Name of Course with Code: Data Structures & Algorithms (3250324)

Class: 2nd Year 1st Sem (MAC) **Session: July-December 2024**

Session	Date	Content to be covered	COs	BL	% Coverage
1		Revision I: Array, Dynamic Allocation	CO1	1	1.7
2		Revision II: Pointer and Structures	CO1	1,2	1.7
3		Start and implementation of static stack	CO2	2,3	2.5
4		Stack and its Uses	CO3	4	2.5
5		Polish Representation: Basics, Infix to Postfix using Stack	CO2	2	2.6
6		Evaluation of Expression in Posfix using Stack; implementation	CO4	3,4	2.5
7		Polish Representation : Completing the Implementation	CO5	3,4	2.5
8		Queue : Linear Queue Implementations	CO1	1	2.4
9		Queue: Circular Queue Implementations	CO2	2,3	2.8
		Dequeue and its implementation	CO3	2,3	2.5
10		Searching: Linear and Binary Search	CO1, CO2	1,2	2.5
11		Other searching Techniques	CO2	2	2.5
12		Hashing Basics and Hashing Techniques	CO1,CO2	1	2.7
13		Implementation of hashing	CO3	3,4	2.5
14		Collision and its handling	CO4	3,4	2.6
15		Sorting: Bubble Sort, Selection Sort	CO2,CO3	2,3	2.6
16		Selection Sort, Insertion Sort	CO2,CO3	2,3	2.6

17		Insertion Sort, Shell Sort, Radix Sort	CO3,CO4	3,4	2.7
		Quick Sort, Merger Sort	CO4	3,4	2.5
18		Introduction to linked implementation - I	CO1	1	2.3
19		Introduction to linked implementation - II	CO1	1	2.3
20		Formal Implementation of Linked List and traversal	CO3,CO4	2,3	2.8
21		Linked List: Searching, insert at head and other operations	CO4	3,4	2.8
22		Linked List: Deletions	CO4	4,5	2.7
23		Linked List: Reversing, breaking	CO5	5,6	2.6
24		Circular and Doubly Linked List	CO3	3,4	2.5
25		Linked Stack and Linked Queue	CO3,CO4	3,4	2.5
26		Josephus Problem, Polynomial Implementation	CO5	5,6	2.6
27		Binary Tree, definitions, types, traversals	CO1	1	2.4
		Forest, expression tree, binary search tree	CO1	1,2	2.4
28		Binary Search Tree: Creation and displaying	CO2,CO3	3,4	2.7
29		Recursive traversals, display tree and other functions	CO3,O4	3,4	2.5
30		Binary Search Tree: Searching, Tree Sort	CO2	2	2.6
31		Non-recursive traversals, height of a tree	CO2	2	2.4
32		Deletion in Binary search Tree	CO5	4,5	2.3
33		AVL Tree: Definition, Creation	CO1,CO2	1,2	2.6
34		AVL Tree: Deletion	CO3	3	2.4
35		Graph definition and representation	CO1	3	2.6
36		Graph: DFS, BFS, Kruskal Algorithm	CO2,CO3	3,4	2.6
37		Graphs: Prim's and Dijkstra Algorithms	CO4	3,4	2.5

Department of Engineering Mathematics & Computing

Faculty Details

Name of the Faculty: **Dr. J. K. Muthele**
Designation: Associated professor
Department: Department of Engineering Mathematics & Computing

Course Details

Name of the Program: B.Tech. in Mathematics & Computing, July-Dec. 2024
Branch: Mathematics & Computing
Semester: Second Year (Third Semester)
Title of the Subject: Numerical Techniques **Subject Code**: 3250325
Number of Students: 78

LECTURE PLAN#

Name of Course with Code: Numerical Techniques (3250325)

Class: 2nd Year 1IIrd Sem (MAC) Session: July-December 2024

Session	Date	Content to be covered	COs	BL	% Coverage
1.		Algorithms and flow charts	CO1	1	1.7
2.		Introduction to numerical computing and approximations and errors	CO1	1,2	1.7
3.		Classification of Errors with Examples	CO1	2,3	2.5
4.		Introduction Algebraic & Transcendental and Bisection method	CO1	4	2.5
5.		Regula Falsi method and Iteration method	CO1	2	2.6
6.		Newton Raphson method	CO1	3,4	2.5
7.		Secant method	CO1	3,4	2.5
8.		convergence of iterative methods	CO1	1	2.4
9.		Introduction of Simultaneous linear algebraic Equations & Finite Difference and Gauss elimination	CO2	2,3	2.8
10.		Gauss Jordan method, LU decomposition,	CO2	2,3	2.5
11.		Jacobi method, Gauss Seidel method	CO2	1,2	2.5
12.		SOR method, Ill and well condition of equations	CO2	2	2.5
13.		Discuss to Finite Differences and relation with various operators	CO2	1	2.7
14.		Differences of a polynomial, Factorial Notation	CO2	3,4	2.5
15.		Interpolation, Extrapolation for equally and unequally with methods	CO4	3,4	2.6

16.		Numerical differential up to second order for equally unequally	CO3	2,3	2.6
17.		Numerical differential up to second order for unequally intervals	CO3	2,3	2.6
18.		Numerical Integration	CO3	3,4	2.7
19.		Newton-Cotes integration formulas,	CO3	3,4	2.5
20.		Trapezoidal, Simpson's rules (1/3)	CO1	1	2.3
21.		Simpson's rules (3/8) and Weddle rules.	CO1	1	2.3
22.		Introduction of Numerical solution of ODE	CO4	2,3	2.8
23.		Picard's method, Euler's method	CO4	3,4	2.8
24.		Modified Euler's method, Taylor series method,	CO4	4,5	2.7
25.		Runge Kutta methods fourth order	CO4	5,6	2.6
26.		Multistep methods:	CO4	3,4	2.5
27.		Milne's Predictor corrector method	CO4	3,4	2.5
28.		Numerical solution of the simultaneous linear differential equation,	CO4	5,6	2.6
29.		Second order differential equation.	CO4	1	2.4
30.		Picard's method, Euler's method	CO4	1,2	2.4
31.		Modified Euler's method, Taylor series method,	CO4	3,4	2.7
32.		Runge Kutta methods fourth order	O4	3,4	2.5
33.		Introduction of Finite Difference Methods	CO5	2	2.6
34.		Classification of partial differential equation	CO5	2	2.4
35.		Finite difference method	CO5	4,5	2.3
36.		Numerical solution of Partial Differential equations,	CO5	1,2	2.6
37.		five-point formula for Laplace equation	CO5	3	2.4
38.		diagonal Five point formula for Laplace equation	CO5	3	2.6
39.		Numerical solution of Partial Differential equations, five- point formula for Poisson equation.	CO5	3,4	2.6
40.		diagonal Five point formula for Poisson equation	CO5	3,4	2.5

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Modes of Teaching Subject: Numerical Techniques (3250305)

UNIT	CONTENT	MODE
Unit-1	Introduction to numerical computing and approximations and errors	Online mode
	Classification of Errors with Examples	Offline / Black Board Teaching
	Introduction Algebraic & Transcendental and Bisection method	Online Mode
	Regula Falsi method and Iteration method, Newton Raphson method and Secant method	Learning through experimentation
	Convergence of iterative methods	Activity based Learning
Unit-2	Introduction of Simultaneous linear algebraic Equations & Finite with various methods solve for linear Eqs.	Online mode
	Discuss some methods as Gauss Jordan method, LU decomposition,	Offline / Black Board Teaching
	Jacobi method Gauss Seidel method	Offline / Black Board Teaching
	Differences of a polynomial, Factorial Notation	Learning through experimentation
	SOR method, Ill and well condition of equations	Group based Learning
Unit-3	Discuss to Finite Differences and relation with various operators	Online
	Interpolation, Extrapolation for equally and unequally with methods	Offline / Black Board Teaching
	Numerical differential and Integration	Offline / Black Board Teaching
	Discuss some methods as Trapezoidal, Simpson's rules (1/3) Simpson's rules (3/8) and Weddle rules.	Offline / Black Board Teaching
	Uses of Numerical Differentiation & Integration	Learning through experimentation
Unit-4	Introduction of Numerical solution of ODE	Online
	Picard's method, Euler's method, Modified Euler's method, Taylor series method,	Offline / Black Board Teaching
	Runge Kutta methods fourth order	Learning through projects

	Multistep methods: Milne's Predictor corrector method	Offline / Black Board Teaching
	Numerical solution of the simultaneous linear differential equation,	Offline / Black Board Teaching
Unit-5	Introduction of Finite Difference Methods	Online
	Classification of partial differential equation	Activity based Learning
	Numerical solution of Partial Differential equations, five-point formula for Laplace equation	Offline / Black Board Teaching
	Numerical solution of Partial Differential equations, five-point formula for Poisson equation	Offline / Black Board Teaching
	diagonal Five point formula for Laplace equation	Activity based Learning
	diagonal Five point formula for Poisson equation	Learning Through Demonstration
	Some Problems	Group based Learning

Online	Offline						
	Black Board Teaching	Group based Learning	Learning through projects	Learning through demonstration	Learning through experimentation	Activity based Learning	Onsite/field based learning
24%	36%	8%	8%	4%	12%	8%	-