Session 2022-2023 SEM B:
B. Tech. II Year
C. CO24508: Operating Systems
Lecture Plan

S. NO.	Topics	No of Lectures
1.	**Introduction to Operating Systems**: Function, Evolution, Desirable Characteristics and features of an O/S.	3
2.	Operating Systems Services: Types of Services, Different ways of providing these Services– Utility Programs, System Calls.	4
3.	**Process Management**: Concept of a process, Process State Diagram, Process based kernel, Dual mode of process execution, CPU scheduling algorithms, deterministic modeling.	3
4.	System calls for Process Management, Process Management in UNIX & Windows.	3
5.	Concept of Threads: User level & Kernel level Threads.	2
6.	**Inter Process Communication**: Real and Virtual Concurrency, Mutual Exclusion, Synchronization, Critical Section Problem, Solution to Critical Section Problem: Semaphores and their Operations and their implementation. IPC in UNIX & Windows.	3
7.	Deadlocks: Deadlock Problems, Characterization, Prevention, Avoidance, Recovery.	2
8.	**Memory Management**: Different Memory Management Techniques – Partitioning, Swapping, Segmentation, Paging, Paged Segmentation, Comparison of these techniques, Memory management in UNIX & Windows.	3
9.	Techniques for supporting the execution of large programs: Overlay, Dynamic Linking and Loading, Virtual Memory – Concept, Implementation by Demand Paging etc.	3
10.	**File Systems Management**: File Concept, User's and System Programmer's view of File System, Disk Organization, Tape Organization, Different Modules of a File System, Disk Space Allocation Methods – Contiguous, Linked, Indexed.	4
11.	Directory Structures, File Protection, Disk Scheduling Algorithms.	2

12.	System Calls for File Management, File Systems in UNIX	3
	& Windows.	
13.	**Input / Output Management**: Principles and Programming, Input/Output Problems, Different I/O operations: Program Controlled, Interrupt Driven, Concurrent I/O, Asynchronous Operations, Logical structure of I/O function, I/O Buffering, Kernel I/o Subsystem. I/O management in UNIX & Windows.	3
14.	Introduction to Network, Distributed and Multiprocessor Operating Systems.	2
15.	Case Studies: Unix/Linux, Windows and Contemporary Operating Systems.	4
16.	Study of Source Code of Open Source Operating System like Linux.	3
	Total	**47**

Prof. D. A. Mehta

Session 2022-2023 SEM B:

B.Tech. II Year

CO24553: Discrete Structures

Lecture Plan

Lectures	Topics
1	Discussion on Course Objective, Course outcomes, syllabus, CW evaluation and Theory Exam details. Introduction to Discrete Structures
2	Introduction to set theory, Types of sets, Set Representation, Examples
3	Basic Set operations, Set Identities and proofs, Venn Diagram
4	Finite Set, Infinite Set, Principle of Mathematical Induction
5	Examples of Mathematical Induction, Principle of Inclusion-Exclusion; and examples
6	Introduction to propositional logic, Basic logical operations, Propositions and truth table
7	Tautologies and contradictions, Logical Equivalence of propositions
8	Algebra of propositions, Propositional functions and Quantifiers
9	Introduction to predicate logic
10	Introduction to basic counting principles, Permutation and Combinations
11	Examples on Permutation and combination
12	Introduction to ordered sets and relations, Representation of relations, Binary, ternary and n-ary relations
13	Types of relations: reflexive, irreflexive, symmetric, antisymmetric, transitive
14	Equivalence relation and partial order relation, Equivalence classes and partition of sets
15	POSet and lattices, examples
16	Functions and types of functions: One-to-one, onto
17	Pigeonhole Principle, Application of relations and functions to RDBMS and Hashing
18	Graphs: Basic terminologies, Types of graphs: subgraph, multigraph, connected graph, disconnected graph, isomorphic graph
19	Paths, connectivity, Eulerian Path and Circuit, Theorems
20	Hamiltonian path and circuit, Travelling sales person problem
21	Weighted Graph and Shortest Path Algorithm
22	Complete, Regular and Bipartite Graphs, Planar Graphs and Euler Theorem
23	Trees, Basic terminologies, Types of Trees, Properties of trees and proof by

	induction
24	Binary trees, Prefix Codes, Huffman's Algorithm
25	Spanning Trees, Minimum cost spanning tree, Kruskal's Algorithm
26	Prim's Algorithm and Problem Solving, Representation of Trees and Graphs in memory
27	Applications of Trees and Graphs in computer science
28	Introduction to Recurrence Relations, Recursion, Recursively defined sequences
29	Recursively defined sets and functions, Examples
30	Solving Recurrence Relations, Substitution Method
31	Solving Linear Homogeneous Recurrence Relations with Constant Coefficients, Problems
32	Generating Functions: Introduction, Useful generating functions
33	Solving Generating Functions
34	Introduction to Computational Complexity
35	Algebraic Systems: Introduction, Structure, General Properties
36	Semigroups and Monoids, Examples, Theorems
37	Groups, Abelian Group and Subgroups
38	Homomorphism and Isomorphism, Examples
39	Rings, Commutative Rings, Integral Domain and Fields
40	Problem Solving

Ms. Ritambara Patidar

Session 2022-2023 SEM B:

B.Tech. II Year

CO24507: Data Structure

DETAILED LECTURE PLAN:

Unit	Topic	Lectures
1	Unit 1:Introduction to Data Structures	
1.1	Introduction to Data Structure: Concepts of Data and Information	01
1.2	Classification of Data structures, Abstract Data Types, Implementation using STL	02
1.3	Implementation aspects: Memory representation. Data structures operations and its cost estimation.	01
1.4	Arrays	01
1.5	Linked List: memory representation, different implementation	02
1.6	Circular Linked List, doubly linked list	02
2	Unit 2:Stack & Queue	
2.1	Stacks as ADT	01
2.2	Different implementation of stack using STL , multiple stacks	02
2.3	Application of Stack: Conversion of infix to postfix notation using stack, evaluation of postfix expression, Recursion.	02
2.4	Queues as ADT	01
2.5	Different implementation of queue using STL	02
2.6	Circular queue, Dqueue and Priority Queue, Queue simulation, Application of queues.	02
3	Unit 3:Tree	
3.1	Tree: Definitions - Height, depth, order, degree etc. Binary Search Tree -operations, traversal	02
3.2	Limitation of Binary Search Trees, Height balanced tress, AVL Trees, rotations in AVL trees.	02
3.3	Heap, types-max heap, min heap, insertion and deletion in heap, Applications and comparison of various types of trees.	02
3.4	Introduction to forest, multi-way Tree, B tree, B+ tree, B* tree	02
3.5	Red Black Tree	01
4	Unit 4:Gra ph	
4.1	Graphs: Introduction, Classification of graph: Directed and Undirected graphs, etc., Representation	01
4.2	Graph Traversal: Depth First Search (DFS), Breadth First Search (BFS),	01
4.3	Graph algorithm: Minimum Spanning Tree (MST)-Kruskal, Prim's algorithms	01
4.4	Dijkstra's shortest path algorithm; Comparison between different graph algorithms. Application of graphs.	02
5	Unit 5:Sortin g	
5.1	Sorting: Introduction,different types of sorting- inplace/not in place, external/internal, stable/unstable, counting based/comparison based. Sort methods like: Bubble sort.	01
5.2	Quick sort	01
5.3	Selection sort, Heap sort	01

5.4	Insertion Sort, shell sort	01
5.5	Merge sort, radix sort	01
5.6	Hashing, components of hashing, collision, collision resolution techniques, linear probing, quadratic hashing	01
5.7	Comparison of various sorting algorithms, Case Study: Application of various data structures in operation	02

Ms. Priyanka Bamne

DEPARTMENT OF COMPUTER ENGINEERING			
B Tech. III YEAR Semester "B"			
CO34554: FIS			
Detailed Lecture Plan			
S. No	**Date**	**Topic**	**No. of Lectures**
		Introduction	
1	7/2/2023	Introduction to subject,co,syllabus and evaluation ceriteria	1
2	8/2/2023	Basic terminilogies of security and their definations,security services.and mechanisms	2
3	9/2/2023	Attackes and types of attacks	3
		Mathethametical foundation of cryptography	
4	13/2/2023	Integer Arithmetic and Euclidian Algorithm	1
5	14/2/2023	Extended Euclidian	2
6	15/2/2023	Modulo Arithmetic	3
7	20/2/2023	Fermat's Little Theorem	4
8	21/2/2023	Euler Phi Function	5
9	22/2/2023	EulerTheorem	6
10	23/2/2023	Algebraic Structure	7
		Symmetric key Encryption	
11	27/2/2023	Symmetric key Encryption,Type of Encrytion and introduction to Symmetric Key Encryption	1
12	28/2/2023	Classical Cryptograghy : Ceaser Cipher and Monoalphabetic	2
13	1/3/2023	Polyalphabetic Substitution	3
14	2/3/2023	Playfair	4
15	6/3/2023	Hill Cipher	5
16	7/3/2023	Numerical Solving session on classical algorithms	6
17	13/3/2023	Cryptanalysis, Block and Stream Cipher,padding	7
18	14/3/2023	P Box and S box	8
19	15/3/2023	Product Cipher and Fiestal Cipher	9
20	20/3/2023	DES	10
21	21/3/2023	AES	11
22	27/3/2023	AES	12
23	28/3/2023	Block Ciphers :ECB,CBC,CFB,OFB	13
		Asymmetric Key Cryptography	
24	29/3/2023	RSA	1
25	3/4/2023	Diffie-Hellman Key Exchange algorithm	2
26	5/4/2023	ECC	3
27	6/4/2023	Elgamel Key Exchange	4
28	10/4/2023	Various types of attacks on Cryptosystems.	5
		Authentication & Integrity	
29	11/4/2023	Introduction and level of Authentication	1
30	12/4/2023	MAC	2
31	13/4/2023	Hash function	3

32	13/4/2023	MD5	4
33	17/4/2023	SHA	5
34	18/4/2023	HMAC	6
35	19/4/2023	Digital signature	7
		E-mail, IP and Web Security	
36	20/4/2023	Firewall and its types	1
37	20/4/2023	PGP, MIME, S/MIME; IP security protocols	2
38	24/4/2023	Web security – TLS, SSL	3
39	25/4/2023	Secure Electronic Transaction(SET)	4
40	26/4/2023	IDPS	5

Ms. Nikita Tiwari

B Tech. III YEAR Semester "B"

CO34553: Machine Learning

SUMMARY LECTURE PLAN:

S.No.	Topic	Lectures
1.	Introduction to Machine Learning	08
2.	Artificial Neural network	12
3.	Support Vector Machines	07
4.	Clustering Algorithms	09
5.	Learning Theory	04
		40

DETAILED LECTURE PLAN:

Lecture No.	
	Unit-1 : Introduction to Machine Learning
1	CO's, Assessment policies, Scope of subject, What is covered? And what is not covered? Introduction to machine learning, Basics of ML, History of ML, Evolution of ML
2	Types of Machine Learning- Supervised, Unsupervised, Reinforcement, Semi-Supervised, Generative Adversarial Networks.
3	Linear regression, intuition, mean squared error cost function.
4	Gradient Descent algorithm, R-squared, adjusted R-squared.
5	Underfitting, Overfitting, Bias variance trade-off.
6	Logistic regression algorithm, binary cost entropy cost function, sigmoid activation function, confusion matrix, roc curve .
7	Multinomial Logistic regression, softmax activation function, cost entropy cost function.
8	Hold out Methods, Applications of Machine Learning, ML Tools.
	QUIZ-1
	Unit-2 : Artificial Neural Network
9	Introduction to Artificial Neural Network, Biological neuron.
10	McCulloch Pitts Neuron models, implementing different logical gates using McCulloch Pitts Neuron.
11	Activation Functions, Loss Functions.
12	Perceptron, Multilayer neural networks.
13	Gradient Descent, Momentum Based, Nesterov, Mini-Batch, Stochastic, Adaptive learning.
14	AdaGrad, RMSProp, Adam, comparison between all variants of GD
15	Sigmoid neuron
16	Back-propagation algorithm, back-propagation calculus, initialization.
17	Training rules of Back propagation, issues in back-propagation.
	MST-1
18	Bayesian Learning, naive bayes classifier

19	Competitive learning
20	Self-organization map.
	Unit-3 : CNNs & Support Vector Machines
21	Introduction to Convolutional Neural network - motivation behind it, its applications.
22	Working of CNN- convolution layer, padding, pooling, stride.
23	Case Study of Alexnet.
24	Introduction to Support Vector Machines, SVM Formulation, Interpretation & Analysis.
25	Margin, Hyperplane, Support vector.
26	Hard and soft margin, Hinge loss, SVM dual.
27	SVM Kernels.
	QUIZ-2
	Unit-4: Clustering
28	Clustering, distance measures, types of Clustering- Partitional, Hierarchical, Density Based.
29	K-Means Clustering, Elbow method, Mean Shift Clustering.
30	Agglomerative clustering, Dendrograms, Single Linkage, Multiple Linkage, Average Linkage.
31	Birch Algorithm, CURE Algorithm.
32	Density-based Clustering- DBSCAN, core, border, noise points.
	MST-2
33	Cluster validity, scatter Coefficient, silhouette coefficient.
34	Association Rule Mining.
35	Gaussian Mixture Models.
36	Expectation Maximization. Parameters estimations – MLE, MAP.
	Unit-5: Learning Theory
37	Probably Approximately Correct (PAC) Model, PAC Learnability.
38	Agnostic PAC Learning.
39	Generalization error bounds, VC Model.
40	Theoretical analysis of Machine Learning problems & algorithms.
	QUIZ-3

Ms. Himani Mishra

B Tech. III YEAR Semester "B"
CO34563: Design and Analysis of AlgorithmsLecture Plan

S.NO	Topics	No of Lectures
1.	Introduction	3
2.	Asymptotic notation	2
3.	Divide and conquer	3
4.	Recurrences	3
5.	Greedy Methods	2
6.	Dynamic programming	3
7.	Backtracking	2
8.	Randomized Algorithms	2
9.	NP Problems	3
10.	Code tuning techniques	2
11.	Sorting Algorithms	3
12.	Searching Algorithms	3
13.	Data Structures Algorithms	3
14.	Graph/Tree Algorithm	4
15.	Number-theoretic algorithms	2
16.	Data Stream Algorithms	1
17.	Semi-Numerical Algorithms	1
18.	Parallel algorithm	2
19.	Algorithm Mathematics(Probability Model)	3
20.	Test/Exam paper discussion	3
	Total	**50**

B Tech. III YEAR Semester "B"
CO3463: Design and Analysis of AlgorithmsDetail Lecture Plan

Lec #	Topics
L 1.	Scope of subject, What is covered? And what is not covered?
L 2.	What is algorithm and it's characteristics
L 3.	How to write/express algorithms, and validate an algorithm
L 4.	Analysis attributes/dimensions of an algorithms
L 5.	Asymptotic Notation
L 6.	Recurrence Equation
L 7.	How to define the recurrence relation for a algorithm
L 8.	Recursion tree methods for solving the Recurrence relation
L 9.	Substitution methods for solving the Recurrence relation
L 10.	Master Theorem for solving recurrence equation
L 11.	Code tuning techniques - Introduction
L 12.	Code tuning techniques - Approaches
L 13.	Divide and conquer - Introduction
L 14.	Divide and conquer Algorithms
L 15.	Searching Algorithms Analysis - I (Linear Search)
L 16.	Searching Algorithms Analysis – II (Binary Search)
L 17.	Searching Algorithms Analysis – III (Optimum Searching)
L 18.	Sorting Algorithms Analysis – I (Sequential Sorting)
L 19.	Sorting Algorithms Analysis – II (Non-sequential Sorting)
L 20.	Sorting Algorithms Analysis – III (Optimum sorting)
L 21.	Linear Data structures – Stack, Queue and Link List
L 22.	Nonlinear Data structure - Introduction
L 23.	Nonlinear Data structure – Graph
L 24.	Graph Algorithms - I (Traversing Algorithms)
L 25.	Graph Algorithms – II
L 26.	Nonlinear Data structure - Tree

L 27.	Tree Algorithms
L 28.	Greedy Methods : Introduction
L 29.	Greedy Methods : Knapsack Problem
L 30.	Dynamic programming : Introduction
L 31.	Dynamic programming : Matrix Chain Multiplication
L 32.	Dynamic programming : LCS
L 33.	Backtracking - Introduction
L 34.	Backtracking - Algorithms
L 35.	Randomized Algorithms
L 36.	Number-theoretic algorithms
L 37.	Semi-Numerical Algorithms
L 38.	Untraceable problems
L 39.	NP Problems – Introduction
L 40.	Approximation Algorithms for NP Problem - I
L 41.	Approximation Algorithms for NP Problem - II
L 42.	Average case analysis of algorithm - Introduction
L 43.	Average Case Analysis using probabilistic model – I
L 44.	Average Case Analysis using probabilistic model - II
L 45.	Data Stream Algorithms
L 46.	Parallel algorithms – I
L 47.	Parallel algorithms - II
L 48.	Old Exam Paper Discussion – I
L 49.	Old Exam Paper Discussion – II
L 50.	Old Exam Paper Discussion – III

COURSE POLICIES (Tentative):

Assignments/Tests:

Test - 01	10 %
Test - 02	10 %
Test - 03	10 %
Theory Assignments	20 %
Surprise Quizzes	50 %
Attendance	00 %

Attendance:

For students, attendance is expected for each class meeting.

Assignments:

Will be uploaded on Moodle.

B Tech. III YEAR Semester "B"

CO 34601: Data Science & Engineering

Lecture Plan

S No	Contents	Lecture No
Unit 1		**1-7**
1.	Types of data, Data Quality, Data Distributions	1-3
2.	Probability, linear programming	4-5
3.	Statistics	6-7
UNIT 2		**8-16**
4.	Data Preprocessing: Data Transformation & Cleaning	8-10
5.	Dimensionality reduction, Feature subset Selection, feature creation	11-13
6.	Data similarity measures, feature extraction	14-16
UNIT 3		**17-21**
7.	Data Visualization Techniques	17-19
8.	OLAP & Multidimensional Data Analysis	19-21
UNIT 4		**22-31**
9.	Statistical & Probabilistic analysis of Data	22-24
10.	Multiple hypothesis testing, Parameter Estimation methods	25-27
11.	Correlation & Regression analysis	28-31
UNIT 5		**32-40**
12.	Performance metrics, ROC curve, Cross Validation	32-34
13.	Bagging and its techniques	35-37
14.	Boosting and its techniques	38-40

Ms. Neha Mehra

B.Tech. III Year Semester-B
CO34602: Object-Oriented Software Engineering
Lecture Plan

Lecture No.	Topics
1	Review of Object-Oriented basic Concepts and Principles
2	Review of Software Engineering Concepts: Software Development Life Cycle
3	Review of Software Process and Process Models, Model Architectures of Build and Fix Model, Waterfall Model
4	Iterative Model, Incremental Model, Spiral Model
5	RAD Model, Prototype Model, RUP Model, advantages and disadvantages, application areas of each process model
6	Software Development Problems: Symptoms and Root causes
7	Six Best Practices of RUP: Develop Iteratively, Manage Requirements Properly, Use component architectures
8	Six Best Practices of RUP: Model the software visually, Verify quality, Manage control changes
9	How Best Practices addresses root causes of software development
10	Introduction to Rational Unified Process: Basic concepts, 4+1 view model architecture
11	Phases of RUP: Inception Elaboration, Construction and Transition
12	RUP software life cycle and its 9 Workflows, Core Engg.
13	Supporting Workflows
14	Introduction to UML, Basic Building Blocks: Things, Relationships and Diagrams: Structural and Behavioral Diagrams
15	Structural and Behavioral Diagrams
16	Notations, Types of Relationships: Association, Dependency, Generalization and Realization, Stereotypes and Extensibility Mechanisms
17	Study of UML based tools like Star UML
18	Object Oriented Analysis: Conventional v/s OO analysis approach
19	Requirement analysis, Use cases, Actors of the system, Use case diagram

20	Activity, Components of Activity diagram, Examples
21	Types of classes, Analysis class diagram
22	Object Oriented Design: Conventional v/s OO design approach, Designing of Class Responsibility Collaborator cards
23	Class diagram with examples
24	Object Diagram with examples
25	Behavioral Modelling: Interaction Diagram, Sequence Diagram and examples
26	Collaboration Diagram and examples
27	State chart Diagram with real life problems
28	Implementation Diagram: Component Diagram and Deployment Diagram, Components of both diagrams
29	Interfaces, Ports and Package Diagram
30	Review of testing strategies, Introduction to Object-Oriented Testing
31	Comparison with conventional testing techniques
32	Correctness and consistency of OOA and OOD models
33	Types of Testing: Class Testing, Integration Testing
34	Validation Testing, System Testing, Examples
35	Testing Strategies and test cases for OO software process
36	Introduction to Software Project Management, its phases, entry and exit criteria's of each phase
37	Introduction to Configuration and Change Management, Process
38	Introduction to Software Quality Assurance: Quality Parameters, Various Standards
39	Introduction to Six Sigma model, CMM Model, RUP
40	Introduction to Design Patterns: Basics, Types of Design Patterns

Dr. Anuradha Purohit