MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous &NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Advanced Discrete Mathematics

(OC-II) MAC- 910213

L	T	P	C
3	0	0	3

Objective of Course

- To have knowledge of basic algebra and discrete numeric function.
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer
- To familiarize the discrete numeric function and generating function

UNIT 1:

Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan's law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, functions, Injection, Surjection and Bijective mapping, Composition of functions, Permutations, the characteristic functions and Mathematical induction.

UNIT 2:

Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, Lattices, sub lattices, Isotonicity, distributive inequality, Lattice homomorphism, lattice isomorphism ,complete lattice ,complemented lattice distribution lattice .

UNIT 3:

Group axioms, permutation group, sub group, co-sets, normal subgroup, semi group, Lagrange theorem, fields, minimal polynomials, reducible polynomials, primitive polynomial, polynomial roots, applications.

UNIT 4:

Finite graphs, incidence and degree, isomorphism, sub graphs and union of graphs, connectedness, walk, paths and circuits, Eulerian and Hamiltonian graphs. Trees: properties of trees, pendant vertices in tree, Center of tree, spanning trees and cut vertices, binary tree ,matrix representation of graph, incidence and adjacency matrix and their properties, applications of graphs in computer science.

UNIT 5:

Introduction to discrete numeric functions and generating functions, introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Acquire Knowledge of set theory
CO2	Analyse the concept of Lattices
CO3	Identify the concept of Group Theory
CO4	Derive the Inferences from Graph theory
CO5	Illustrate the Discrete numeric function and recursive relation

Recommended Books:

1. J.P Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science, McGraw-Hill, 1st Edition 2017.
2. NersinghDeo: Graph Theory, PHI Learning, 2014.
3. C.L Liu: Discrete Mathematics.4th Edition 2012.
4. Rosen: Discrete Mathematics and its Applications, McGraw Higher Ed, 7th Edition 2008.
5. N. Herstein: Topics in Algebra, Wiley, 2nd Edition 2006.

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Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Optimization Techniques

(OC-II)

MAC-910214

L	T	P	C
3	0	0	3

Objective of Course

- To know how to formulate and solve Linear Programming problem and Non Linear Programming problems
- To familiarize with PERT/CPM techniques
- To explore the Game Theory
- To make the student acquire sound knowledge of inventory models

Linear Programming:
Linear Programming Problem (LPP): Historical development, models and modeling, classification, general methods for solving OR models, Formulation of LPP, Graphical method, Simplex method, Duality theory in linear programming and applications, Dual simplex method, Transportation and Assignment problems.

Non Linear Programming:
Non Linear Programming Problems (NLPP): Introduction of NLPP, constraints problems of maxima and minima, constraints in the form of equations (Lagrangian method), constraints in the form of inequalities. Dynamic Programming: Basic concepts, Bellman's optimality principle, dynamic programming approach in decision making problems, optimal subdivision problems.

Project management PERT and CPM:
Project management, Origin and use of PERT, origin and use of CPM, project network, diagram representation, Critical Path calculation by linear program, Critical Path calculation by network analysis and Critical Path calculation (CPM), determination of floats, construction of time charts and resource labeling, project cost curve and crashing in project management, project evaluation and review techniques (PERT).

Game Theory:
Introduction to game theory, competitive games, finite and infinite games, two persons zero sum game, pure and mixed strategies, saddle point, maxmin and minimax principle, solution of a rectangular game in terms of mixed strategies, Graphical method of (2xm) and (nx2) games.

Inventory models:
Introduction to inventory problems, deterministic models, classical EOQ (Economic Order Quantity) models, inventory models with deterministic demand (No shortage and shortage allowed), Multi item deterministic models, Price break models, and Inventory models with probabilistic demand.

Course Outcomes

After completing of this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the solution of Linear Programming Problem
CO2	Express the solution of Non Linear Programming Problem
CO3	Find the Optimal solution using PERT/CPM
CO4	Acquire the knowledge of Game theory.
CO5	Evaluate the different models of inventory.

Recommended Books:

1. B. E. Gillet: Introduction to Operation Research, Computer Oriented Algorithmic Approach, McGraw Higher Ed, 1st Edition 1984.
2. A. Ravindran and J. J. Solberg: Operations Research Principles, Wiley, 2nd Edition 1987.
3. P. R. Thie and G. E. Keough: An Introduction to Linear Programming & Game Theory, Wiley, 3rd Edition 2008.
4. H. A. Taha: Operations Research an Introduction, Pearson, 9th Edition 2014.
5. I. Griva, S. G. Nash and A. Sofer: Linear and Non Linear Optimization, Taylor & Francis Group, 2014

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Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Engineering Reliability

(DE –II)

MAC -250731

L	T	P	C
3	0	NIL	3

Course Objectives:

- To understand the concept of Reliability.
- To evaluate measures of reliability
- To determine the maintainability and availability
- To explore Software reliability growth model

Unit-I

Introduction to reliability, define failure/ hazard rate, network modelling and reliability evaluation basic concepts, evaluation of network liability systems, parallel systems, series parallel systems, partially redundant systems, k- out- of- m systems, types of redundancies, evaluation of network reliability using conditional probability method, paths based and cut set based approach, complete event tree and reduced event tree methods.

Unit-II

Time dependent probability basic concepts, reliability functions f(t), F(t), R(t), h(t) relationship between this functions bath tubs curve, exponential, Gama Weibull's and Rayleigh's failure density and distribution functions expected value and standard deviation of distribution, measures of reliability MTTF and MTTR MTBF,MTTF for series and parallel systems

Unit-III

Discrete Markov chains and continuous Markov processes, basic concepts of stochastic transitional probability Matrix, time dependent probability evaluation, limiting state probability evaluation, Markov processes-modelling concepts state space diagrams, time dependent reliability evaluation of single component repairable model evaluation of limiting state probability of one-two component repairable models.

Unit - IV

Concept of maintainability, availability, availability function, type of system availability, economies of reliability engineering, replacement of items, standby system maintenance costing and budgeting preventive maintenance.

Unit - V

Software reliability growth model, Classification of Software Reliability Models, Analytical Model, Dynamic or Probabilistic Model- Discrete Time Models and Continuous Time Models and their testing.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Determine the reliability of system
CO2	Evaluation of measure for system reliability
CO3	Apply Markov process to carried out system reliability
CO4	Acquire the knowledge of maintainability and availability of system
CO5	Describe Software reliability growth model

Text Books:

1. Mathematical Statistics by C.E.Weatherbum.
2. Fundamentals of Mathematical Statistics by S C Gupta and V K Kapoor- S. Chand & Sons, New Delhi.
3. Fundamentals of Applied Statistics by S C Gupta and V K Kapoor, S Chand & Sons, New Delhi.

Reference Books:

1. An outline of Statistical Theory by Goon, Gupta and Dasgupta.
2. Fundamentals of Statistics by Goon, Gupta Dasgupta

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Distributed Computing

(DE- II)

MAC-250732

L	T	P	C
3	0	NIL	3

COURSE OBJECTIVES

- To provide students contemporary knowledge of distributed systems.
- To equip students with skills to analyze and design distributed applications.
- To gain experience in the design and testing of a large software system, and to be able to communicate that design to others.

Unit - I

Introduction to Distributed Systems: Architecture for Distributed System, Goals of Distributed System, Hardware and Software Concepts, Distributed Computing Model, Advantages & Disadvantage Distributed System, Issues in Designing Distributed System.

Unit -II

Distributed Share Memory: Basic Concept of Distributed Share Memory (DSM), DSM Architecture & Its Types, Design & Implementations Issues in DSM System, Structure of Share Memory Space, Consistency Model and Thrashing.

Unit - III

Distributed File System: Desirable Features of Good Distributed File System, File Model, File Service Architecture, File Accessing Model, File Sharing Semantics, File Catching Scheme, File Application & Fault Tolerance.

Unit - IV

Inter Process Communication and Synchronization: Data Representation & Marshaling, Group Communication, Client Server Communication, RPC Implementing, RPC Mechanism, Stub Generation, RPC Messages. Synchronization: - Clock Synchronization, Mutual Exclusion, Election Algorithms - Bully & Ring Algorithms.

Unit - V

Distributed Scheduling and Deadlock Distributed Scheduling- Issues in Load Distributing, Components for Load Distributing Algorithms, Different Types of Load Distributing Algorithms, Task Migration and its issues. Deadlock- Issues in deadlock detection & Resolutions, Deadlock Handling Strategy, Distributed Deadlock Algorithms. Case Study of Distributed System: Amoeba, Mach, Chorus.

COURSE OUTCOMES After completion of this course, the students would be able to:

CO's	Description of CO's
CO1	Tell the basic elements and concepts related to distributed system technologies
CO2	Demonstrate knowledge of the core architectural aspects of distributed systems
CO3	Identify how the resources in a distributed system are managed by algorithm
CO4	Examine the concept of distributed file system and distributed shared memory
CO5	Compare various distributed system algorithms for solving real world problems

RECOMMENDED BOOKS:

1. Distributed Operating System Concept & Design, Sinha, PHI
2. Distributed System Concepts and Design, Coulouris & Dollimore, Pearson Publication
3. Distributed Operating System, Andrew S. Tanenbaum, Pearson.

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Deep Learning
(DE-IV)
MAC- 250764

Week 1: Introduction to Deep Learning, Bayesian Learning, Decision Surfaces

Week 2: Linear Classifiers, Linear Machines with Hinge Loss

Week 3: Optimization Techniques, Gradient Descent, Batch Optimization

Week 4: Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning

Week 5: Unsupervised Learning with Deep Network, Autoencoders

Week 6: Convolutional Neural Network, Building blocks of CNN, Transfer Learning

Week 7: Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Week 8: Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization

Week 9: Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc.

Week 10: Classical Supervised Tasks with Deep Learning, Image Denoising, Semanticd Segmentation, Object Detection etc.

Week 11: LSTM Networks

Week 12: Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam

Books and References

1.Deep Learning- Ian Goodfelllow, Yoshua Benjio, Aaron Courville, The MIT Press
2.Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Department of Engineering Mathematics and Computing

B. Tech. (Seventh Semester)

Digital Image Processing

(DE- IV)

MAC- 250765

Week 1: Introduction and signal digitization

Week 2: Pixel relationship

Week 3: Camera models & imaging geometry

Week 4: Image interpolation

Week 5: Image transformation

Week 6: Image enhancement I

Week 7: Image enhancement II

Week 8: Image enhancement III

Week 9: Image restoration I

Week 10: Image restoration II & Image registration

Week 11: Colour image processing

Week 12: Image segmentation

Week 13: Morphological image processing
Week 14: Object representation ,description and recognition

Books and References

1. Digital Image Processing by Rafael C Gonzalez & Richard E Woods, 3rd Edition
2. Fundamentals of Digital Image Processing by Anil K Jain
3. Digital Image Processing by William K Pratt

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B. Tech. (Seventh Semester)

Analytics Using R Programming

(DLC-250704)

L	T	P	C
0	0	4	2

COURSE OBJECTIVES

- To understand the critical programming language concepts.
- To perform data analysis using R commands.
- To make use of R loop functions and debugging tools.

Unit-I

Introduction to R: Basic Syntax in R Programming, Packages, Comments in R, Operators, Keywords, Datatypes, Variables, Input/Output, Control Flow.

Unit-II

Functions: Types of function in R Language, Recursive Functions, Conversion Functions. Data Structures: String, Vector, Lists, Array, Matrices, Factors, Data Frames.

Unit-III

Graphics in R: Basic Plots, Labelling and Documenting Plots, Adjusting the Axes, Specifying Colour, Fonts and Sizes, Plotting symbols, Customized Plotting.

Unit-IV

Object-Oriented Programming in R: Introduction, S3 Classes, S4 Classes, References Classes, Data Munging, Importing Data, Exporting Data.

Unit-V

Analysis & Modeling: Time Series Analysis, Classification, Regression, and Machine Learning: Supervised and Unsupervised Learning.

Course Outcomes

After completing this course, the students will be able to:

CO's	Description of CO's
CO1	Define basic programming constructs used in R
CO2	Explain the various commands used in R
CO3	Apply various concept of programming for controlling the flow of data using R.
CO4	Analyze the concept of concept of object oriented programming in R.
CO5	Choose and predict appropriate packages of R programming for dealing various tasks

Recommended Books:

- "R for Beginners", Sandip Rakshit, Tata Mc Graw HillEducation.
- "R programming for Data Science", Roger D. Peng, Learnpublishing.