MT203 Applied Operations Research

Prerequisites: CS101, Standard XII Mathematics or equivalent.

Course Contents:

Decision making in Operations Research **(5%)**

Linear Programming (LP): LP formulations, LP model and resource allocation **(10%)**

LP: Algebraic solutions, standard LP model, simplex method, special cases in simplex method **(10%)**

LP: duality and sensitivity analysis: Definition of dual, primal-dual relationships, economic interpretation of duality, dual simplex method, sensitivity analysis **(10%)**

Transportation Model: solution of the transportation model, assignment model **(10%)**

Networks: network minimization, shortest route problem, maximal flow problem, LP representation of networks **(10%)**

Revised simplex method for LPP, bounded variables, decomposition algorithm **(10%)**

Integer programming: cutting plane algorithm, branch and bound method. **(10%)**

Dynamic programming: Problem of dimensionality, solution of linear programs by dynamic programming **(10%)**

Project scheduling by PERT-CPM: critical path calculations, construction of time chart and resource leveling, probability and cost considerations, project control **(10%)**

Non-Linear programming algorithms **(5%)**

Main Reading

1. Hamdy A.Taha, Operations Research:An Introduction, Pearson Education
2. Pradeep Prabhakar Pai, Operations Research:Principles and practice, OXFORD University Press
3. Frederick S.Hillier and Mark S.Hillier, Introduction to management science: A modeling and case studies approach with spreadsheets,Tata McGraw-Hill.
4. Frederick S Hillier, and Gerald J. Lieberman, Introduction to Operations Research, McGraw Hill.

MT204 Linear Algebra and Applications

Prerequisites: Standard XII mathematics or equivalent.

Course Contents:

Linear Equations in Linear Algebra: Systems of linear equations, row reduction and echelon forms, Vector equations, matrix equation, solution sets of linear systems, linear independence, Matrix of linear transformation. **(15%)**

Matrix Algebra: characteristics of invertible matrices, Partitioned matrices, matrix factorizations, application to computer graphics, dimension and rank. **(15%)**

Determinants: Properties, Cramer's rule, volume and linear transformations. **(10%)**

Vector Spaces: vector spaces and subspaces, linear transformations, Bases, coordinate systems,Dimension of a vector space, rank, change of bases **(15%)**

Eigenvalues and eigenvectors: Characteristics equation, diagonalization, eigen vectors and linear transformations, discrete dynamical systems **(15%)**

Orthogonality: inner product, length,and orthogonality, orthogonal sets, orthogonal projections, Gram-Schmidt process, inner product spaces **(15%)**

Symmetric matrices and quadratic forms: diagonalization of symmetric matrices, quadratic forms, constrained optimization, singular value decomposition, application to image processing and statistics. **(15%)**

Main Reading

1. David C. Lay, Linear Algebra and its Applications, Pearson.
2. Steven J. Leon, Linear Algebra with Applications 8th Edition, Pearson.

Supplementary Reading

1. ATLAST Computer Exercises for Linear Algebra, 2nd edition by Steven J. Leon, Eugene Herman, and Richard Faulkenberry.
2. Student Study Guide, 8E by Steven J. Leon.
3. Visualizing Linear Algebra using Maple by Sandra Keith
4. Understanding Linear Algebra using MATLAB by Irwin and Margaret Kleinfeld
5. Linear Algebra Labs with MATLAB, 3rd ed. by David R. Hill and David E. Zitarelli

PL205 Data and File Structures Lab

Prerequisites: PL105

List of Sample Lab Assignments :

ADT Specifications and Implementation of following basic data structures -

1. String Data Type
2. Sparse matrix
3. Polynomial
4. Singly Linked Linear Lists
5. Singly Linked Circular Lists
6. Doubly Linked Linear Lists
7. Doubly Linked Circular Lists
8. Linked Lists with Header Nodes
9. Generic Linked Lists
10. Stacks
11. Queues

ADT Specifications and Implementation of following non-linear data structures

12. Graphs
13. Binary Trees
14. Binary Search Trees
15. AVL Trees
16. Threaded Binary Trees
17. B-Trees and its variants
18. Tries

Applications of Stacks and Queues

19. Convert infix expression into postfix expression.
20. Evaluate postfix expression
21. Traversing a binary tree – inorder, preorder, postorder