Dept Number	MATH/CS 471	Course Title	Optimization Techniques
Semester Hours	3	Course Coordinator	Math Department
Catalog Description	An elementary introduction to algorithms for finding extreme values of nonlinear functions of several variables with and without constraints. Topics include: convex sets and functions; the arithmetic-geometric mean inequality; Taylor's theorem for functions of several variables; positive definite, negative definite, and indefinite matrices; iterative methods for unconstrained optimization such as the method of steepest descent; the Kuhn-Tucker algorithm; unconstrained and constrained geometric programming; Lagrange multipliers, and penalty function methods. Students will use a computer to study the numerical properties of these algorithms.		

Textbooks

The Mathematics of Nonlinear Programming, by Perressini, Sullivan and Uhl, 1993 ed.

References

Course Learning Outcomes

- To learn the basic methods of optimization.
- To learn to build mathematical models and develop computer programs for solving the models.

Assessment of the Contribution to Program Outcomes

Outcome →	1	2	3	4	5	6	7	8	9	10
Assessed →	X									X

Prerequisites by Topic

Mathematics 221 and 250.

Major Topics Covered in the Course

1. Dynamic programming: stages, states and decision variables {12 classes}
2. Introduction to linear programming: standard model, graphical solution, simplex method, big M Method, unboundedness, inconsistency, shadow prices lower bounds for finding minimum and sorting, lower bound arguments {6 classes}
3. Graphs and the Transportation Model: the transportation model , rooted spanning tree Noide potentials , pivoting transshipment problem merge sort, quick sort, median selection, polynomial algorithms, matrix algorithms {6 classes}
4. Integer Programming, Why not LP?: formulations with binary variables, branch and bound, binary integer programming , dual simplex method , mixed integer programming {7classes}
5. Game theory introduction: solving simple games, games with mixed strategies, graphical solution procedure , solving by linear programming {5 classes}
6. Network analysis: shortest route problem, minimal spanning {4 classes}