PhD Course Syllabus

MA861 Non Linear Programming 4-0-0-4

PO1. **Mathematics knowledge:** Knowledge of advanced level in applied mathematics.

CO1: To understand the theory of convex problems and conditions to attain optimality

PO2. **Problem analysis:** Develop analytical skills to identify, formulate, and analyze complex mathematical problems.

CO2: To understand the concept of dynamic programming to find shortest path

PO3. **Modelling and solutions:** Design solutions for complex problems and evolve procedures for solutions.

CO2: To understand the concept of dynamic programming to find shortest path

CO3: To understand the concept of gradient method for constrained optimisation problems

OBJECTIVES:

The course contains methods to solve nonlinear optimization problems which includes convex programming, KKT optimality conditions, quadratic programming problems, separable methods, geometric and dynamic programming. It also covers some search techniques which are used to solve nonlinear programming problems. It plays a vital role in solving various engineering and science problems.

CO1: To understand the theory of convex problems and conditions to attain optimality

CO2: To understand the concept of dynamic programming to find shortest path

CO3: To understand the concept of gradient method for constrained optimisation problems

Unit-I Convex Sets and Functions, Properties of Convex Functions, Convex Programming Problems, KKT optimality conditions, Optimality conditions.

Unit-II Convex functions. Optimality conditions for unconstrained problems. Optimality conditions for constrained problems with equality and Quadratic Programming Problems.

Unit-III Separable Programming, Geometric Programming, Dynamic programming approach to find shortest path in any network. Search Techniques

Unit-IV Basic optimization methods and their convergence analysis. Unconstrained problems: Basic descent methods, conjugate direction and Quasi Newton methods.

Unit-V Constrained problems: Reduced gradient and Gradient projection methods, penalty and barrier methods, cutting plane methods, and Lagrange methods.

References:

- Nonlinear Programming: Theory and Algorithms, Hanif D. Sherali & C. M. Shetty Mokhtar S. Bazaraa Wiley Publications
- Mokhtar S. Bazaraa, Hanif D. Sherali, and C. M. Shetty, Nonlinear Programming: Theory and Algorithms, Second Edition, John Wiley & Sons, New York 1993**.**
- Solutions Manual to Accompany Nonlinear Programming: Theory and Algorithms C. M. Shetty, Hanif D. Sherali, and M. S. Bazaraa Wiley publications