Nonlinear and Dynamic Programming for ECE

ECE 5500

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Numerical optimization techniques as applied to selected electrical engineering application areas.

Prerequisites and Co-requisites:
Prereq: 3050, or Grad standing in Engineering or Math and Physical Sciences.

Course Goals / Objectives:
- Master computational and mathematical methods for optimization to solve engineering problems
- Be competent with posing an engineering problem as an optimization problem
- Be competent with arguing which algorithm is suitable for solving a given optimization problem
- Be familiar with convergence techniques for optimization algorithms
- Be exposed to modern software packages for numerical optimization
Course Topics:
- Gradient methods, unconstrained and constrained: steepest descent, Newton's method, quasi-Newton method, projection, optimization over convex sets
- Problems with equality constraints, problems with inequality constraints, Lagrange multiplier and KKT Theorem
- Barrier method, method of multipliers, sequential quadratic programming, and Lagrangian algorithms for solving constrained optimization problems
- Applications in electrical and computer engineering: circuit design, communications, estimation, and/or electromagnetics
- Dynamic programming, Pontryagin maximum principle, approximate dynamic programming, model predictive control

Designation:
Elective