Course
SE 58000 – Engineering Optimization

Type of Course
Core course for the ME option of the MSE program

Catalog Description

Credits
3

Contact Hours
3

Prerequisite Courses
Graduate standing

Corequisite Courses
None

Prerequisites by Topics
Good knowledge of linear algebra. Exposure to numerical computing, optimization, and application fields helpful but not required; the applications are kept basic and simple.

Textbook

Course Objectives
The course should benefit anyone who uses or will use scientific computing or optimization in engineering or related work (e.g., systems engineering, machine learning, finance). More specifically, people from the following fields: Electrical Engineering (especially areas like signal and image processing, communications, control, EDA & CAD); Aero & Astro (control, navigation, design); Mechanical & Civil Engineering (especially robotics, control, structural analysis, optimization of thermal systems, design); Computer Science (especially machine learning, robotics, computer graphics, algorithms & complexity, computational geometry); Operation Research; Scientific Computing and Computational Mathematics. The course may be useful to students and researchers in several other fields as well: Mathematics, Statistics, Finance, and Economics.
Course Outcomes

1. To give students the tools and training to recognize convex optimization problems that arise in engineering \((a,e)\)
2. To present the basic theory of such problems, concentrating on results that are useful in computation \((a,e)\)
3. To give students a thorough understanding of how such problems are solved, and some experience in solving them \((a,e)\)
4. To give students the background required to use the methods in their own research or engineering work \((a,e)\)

Lecture Topics

1. Introduction
2. Convex sets
3. Convex functions
4. Convex optimization problems
5. Duality
6. Approximation and fitting
7. Statistical estimation
8. Geometric problems
9. Numerical linear algebra background

Computer Usage

High

Laboratory Experience

None

Design Experience

Low

Coordinator

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Date

5/24/11