

SYSM6305 / MECH6318: Optimization Theory and Practice
Course Syllabus

Course Information:

SYSM6305 / MECH6318, 3 semester hours
Lecture Time: Friday 1:00pm-3:45pm
Starts: August 22, 2016

Fall 2016
Room: ECSN 2.120
Ends: December 15, 2016

Professor Contact Information:

Dr. Jie Zhang
Office Phone: 972-883-4541
Office Hours: Friday 9:30am-11:00am

Office: ECSN 2.226
Email: jiezhang@utdallas.edu

TA: Moinak Pyne
Office Hours: Thursday 11:00am-1:00pm

Office: ME TA office ECSN 2.124
Email: mxp132030@utdallas.edu

Description:

Basics of optimization theory, numerical algorithms, and applications. The course is divided into three main parts: linear programming (simplex method, duality theory), unconstrained methods (optimality conditions, descent algorithms and convergence theorems), and constrained minimization (Lagrange multipliers, Karush-Kuhn-Tucker conditions, active set, penalty and interior point methods). Applications in engineering, operations, finance, statistics, etc. will be emphasized. Students will also use MATLAB's optimization toolbox to obtain practical experience with the material.

Course Pre-requisites co-requisites and/or restrictions:

Course Learning Outcome (CLO):

- Recognize, formulate, and solve linear programming problems
- Understand the simplex method for linear programming
- Learn nonlinear programming with constraints and no constraints
- Understand multi-objective optimization and be able to generate Pareto
- Be able to model complex systems using surrogate modeling and design space reduction techniques
- Be able to apply numerical packages (MATLAB) to solve optimization problems

Topics:

- Generic formulation of optimization problems
- Optimization in MATLAB
- Exposure to classes of optimization problems: Linear-nonlinear, continuous, constrained-unconstrained, single-multiple variables
- Linear programming
- Nonlinear programming with constraints and no constraints
- Multi-objective optimization: Pareto generation, weighted sum method, compromise programming, goal programming, heuristic optimization
- Complex systems modeling: design of experiments, response surface, surrogate modeling
- Optimization of practical problems

Computer Usage:

Most assignments require the use of a computer to generate numerical solutions using MATLAB.

Assignments:

Homework
Course project
Exam

Grading Policy:

[30%] Exam: There will be one midterm exam. Make-up exams will only be allowed for the cases of illness, attendance of a university-sponsored event (such as an athletic activity) or under unusual circumstances. For each case, you are required to provide proper documentation (such as note from athletic advisor).

[40%] Homework Assignments: You will be given enough time to complete all assignments in a timely manner. No late homework assignments will be accepted under any circumstances.

[30%] Final Group Course Project: There will be a final group project to design and optimize a system, including MATLAB codes and a full report.

You have five business days to appeal any grade (contact the instructor or TA during office hours). The five days will be counted starting from the day the assignment or exam is returned or the grade has been provided in eLearning.

References and Materials:

- *Optimization in Practice with MATLAB® For Engineering Students and Professionals*, Achille Messac, Cambridge University Press, 2015
- *An Introduction to Optimization*, 4th edition, Edwin K. P. Chong and Stanislaw H. Zak, Wiley, 2013

Reference Software:

- MATLAB

Policies and Procedures for Students:

The University of Texas at Dallas provides a number of policies and procedures designed to provide students with a safe and supportive learning environment. Brief summaries of the policies and procedures are provided for you at <http://go.utdallas.edu/syllabus-policies>, and include information about technical support, field trip policies, off-campus activities, student conduct and discipline, academic integrity, copyright infringement, email use, withdrawal from class, student grievance procedures, incomplete grades, access to Disability Services, and religious holy days.
