

ENGINEERING OPTIMIZATION (MER 302)

Course Syllabus

Winter 2008

Instructor: Ashok Ramasubramanian
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Office Hours:
Monday & Wednesday 9 to 11 AM (or) by appointment
Walk-ins welcome.

Class meeting times:
Tuesday and Thursday 10:55 AM to 12:40 PM. NWSE 205.
Course website: Use blackboard (online.union.edu)

Course objectives

- To introduce the concepts of engineering optimization.
- To provide the basics necessary to formulate optimization problems.
- To introduce commonly used engineering optimization software.

Grading

- Homework: 50%
- Mid-term exam: 25%
- Final exam: 25%

Note: Both exams will be take-home. The mid-term exam will be held five weeks into the term. Further information will be provided near the exam dates.

Course textbook

Authors: A. Ravindran, K. M. Ragsdell, and G. V. Reklaitis
Title: Engineering Optimization: Methods and Applications, 2nd Edition
ISBN: 978-0-471-55814-9
Publisher: Wiley

We will also be using the following text as a reference:

Author: Jasbir Arora
Title: Introduction to Optimum Design. Second Edition
ISBN: 978-0-12-064155-0
Publisher: Elsevier (Academic Press)

Notes regarding homework

1. Homework assignments will be posted on Tuesday and are due the following Tuesday at the start of class (but may be turned in early). Late homework will not be accepted. In case of special circumstances (e.g., religious observances, athletic travel etc.), please contact me *beforehand* to make alternative arrangements.
2. Take pride in your work and do your best. Discussion with your peers is encouraged, but you are responsible for your own work and each person must turn in a separate assignment even when significant collaboration is involved. *Always list the persons with whom you collaborated.*
3. I expect you to start working on the homework early. You are expected to read ahead and start solving problems even though the material has not yet been covered in class.

Honesty policy

Cheating of any kind will not be tolerated. Any incidents of cheating will be dealt with according to official university policy (i.e., reported to the department head and the dean of students). Cheating on homework assignments and lab reports will at least result in a zero for that particular assignment. Additional penalties, including failing the class, may be imposed depending on the severity of the offense. Cheating on exams will result in a failing course grade.

Students with disabilities

It is the policy of Union College to make reasonable accommodations for qualified individuals with disabilities. We encourage students with disabilities, including non-visible disabilities, to discuss with the instructor(s) (during office hours or after class) appropriate accommodations that help facilitate your learning. You will need appropriate documentation in the Dean of Students Office. All discussions will remain confidential. This discussion must take place within the first 2 weeks of class.

List of topics to be covered

1. Optimum design problem formulation (2 weeks)
2. Unconstrained optimization – Unimodality, convexity, and necessary and sufficient conditions for local and global optima (4 weeks)
 - (a) Optimization of single variable functions – Region elimination methods, Newton-Raphson and other methods requiring derivatives.
 - (b) Optimization of multi-variable functions – Direct search methods (Simplex search, Hooke-Jeeves Pattern search, and Powell’s conjugate direction method) and Gradient-Based methods (Cauchy’s method and Newton’s method).
3. Constrained optimization (3 weeks)
 - (a) Linear programming – Historical remarks, Simplex method, Analytical and computer-assisted solutions.
 - (b) Lagrange multipliers
 - (c) Penalty methods
4. Genetic algorithms, Taguchi methods (1 week)