James Madison University
Department of Mathematics and Statistics
Optimization – Math 340   Fall 2012

MWF 12:20-1:10 Miller G080

Overview: In Math 340, students will develop an understanding of the mathematical modeling and techniques involved in seeking optimal solutions. The course will consider both linear and nonlinear, constrained and unconstrained, optimization. Topics will include golden ratio and Newton's method, steepest descent, the simplex method, Lagrange multipliers and Kuhn-Tucker theory. Other topics may be covered as time permits. There is no specific endpoint we need to reach, so we have flexibility in terms of pace and depth of coverage.

Instructor: Dr. Stephen Lucas.
To contact me: In Person: Roop 112, Office Hours: MWF 8:30-9, MF 11:15-12:05, Th 2-3 or by appointment. Phone: 568-5104, Email: initially stephen.k.lucas@gmail.com, later lucassk@jmu.edu

Textbook: *An Introduction to Optimization, 3rd edition, by Chong and Zak,* from the bookstore or available to download free as a pdf (while on campus) at
http://onlinelibrary.wiley.com/book/10.1002/9781118033340.

Homework, Exams and Grading: Homework exercises will be assigned daily based upon class material, and selected questions will be graded. Larger homework exercises may be combined into projects. Homework will be worth 50% of your final grade. There will be a midterm worth 20% and a final worth 30%. The final exam is timetabled for Wednesday December 12, 10:30-12:30, but there may be take-home portions to exams. Final grades will be related to A≥85, B≥65, C≥50, but may vary depending on the class average and natural divisions between raw scores. Plus/minus grades will also be provided. Borderline cases will be decided based upon class participation, effort, and performance throughout the semester.

Attendance: Attendance is not mandatory. However, past experience suggests there is an extremely strong correlation between attendance and success. If you cannot make a class where homework is being collected, please give to a classmate to give to me on the day. If you miss handing in homework or a test without previously getting my permission, you will receive a zero for that homework or test. If there is a medical emergency and you cannot inform me beforehand, let me know as soon as possible. Any potential clashes should be brought to my attention as soon as possible.

Getting Help: If you need help, ask! The worst thing you can do in a math course is let things slide, since material at the beginning of the course is built upon later. It is best to contact me via email. If you wish to see me outside of office hours, please make an appointment beforehand. I can't guarantee that I will be available if you come and knock on my door at a random time.

While new material will be presented every day, there will always be time for questions, both at the time of presentation and later for homework. If there is something you don't understand, it is quite likely others are having similar difficulties.

Goals of the Course

1. To develop an understanding of the logical structure and style of mathematics by:
   a. Using reason in an orderly, cogent fashion.
   b. Writing clear, well organized solutions to problems.
   c. Evaluating critically and using mathematical definitions.
   d. Constructing proofs of mathematical theorems using direct and indirect arguments.
   e. Evaluating critically the quality of a mathematical proof by considering such things as completeness, assumptions, precision, and flaws.

2. To develop computational skills such as:
   a. Constructing an algorithm to perform a specific task.
   b. Writing a computer program in a high level computer language.
   c. Making approximations using Taylor series and numerical techniques of integration.
   d. Using matrices to solve systems of linear equations.

3. To develop an understanding of the theory of calculus and algebraic structures by knowing:
   a. The theory of maxima and minima of functions.

Nature of the Course Content

MATH 340. Mathematical Modeling I-Optimization. 3 credits. *Offered fall of even numbered years.*

Linear and nonlinear optimization with an emphasis on applications in the sciences, economics and social sciences. Techniques studied include the simplex, Newton and Lagrange methods and Kuhn-Tucker theory. Software packages will be used to implement these methods. *Prerequisites: MATH 237 and MATH 238 or consent of instructor.*