

# MATH 689: Special Topics in Numerical Optimization

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Office hours: Thursdays, 2:30–4:30pm

Lecture: Tuesdays + Thursdays, 12:45–2:00pm  
Blocker 161

## Course Outline

This course will cover the following topics:

- Examples of optimization problems and their solutions
- Optimality conditions for unconstrained nonlinear problems
- Algorithms for unconstrained nonlinear problems
- Algorithms for unconstrained non-smooth problems, derivative-free algorithms
- Optimality conditions for constrained nonlinear problems
- Algorithms for constrained problems

Additional topics may be added at the discretion of the instructor and/or according to interest by students. permits.

## Learning Outcomes and Course Objectives

Optimization methods are all around us – we want to make cars and planes more efficient, want to use fewer buses to run the same number of routes, or get from A to B faster. This course discusses the computational tools available to solving optimization problems on computers once a mathematical formulation has been found. In practice, the methods one can use depend crucially on mathematical properties of the problem under consideration.

At the end of the semester, students are expected to be able to recognize the character of an optimization problem (constrained, unconstrained, smooth, non-smooth) and to choose appropriate algorithms for their solution. Students will also need to be able to understand the basic convergence analysis for these methods, and to implement them in practice.

## Textbook

J. Nocedal and S. J. Wright: Numerical Optimization, 2nd edition, 2006, Springer

## Prerequisites

Basics of programming, analysis. MATH 417 or MATH 609 are very helpful.

## Webpage

Homework assignments and other course information will be posted on

<http://www.math.tamu.edu/~bangerth/teaching.html>

## Exams + Grading

Final course grades will be computed from homework and programming assignments (50%) and exams (50%).

One midterm exam on 3/6/2014 (20%) and one comprehensive final exam 5/7/2014 (8–10am) (30%).

*Make-up exams:* Students must make arrangements in advance if they will not be handing in homework on time or will miss an exam. Absences due to recognized University-related activities, religious holidays, verifiable illness, and family/medical emergencies will be dealt with on an individual basis, but require a written excuse. Please let Dr. Bangerth know about this as soon as possible, and preferably in advance.

*Incompletes:* I will consider giving an incomplete if you have successfully completed all but a small portion of the work of the course, and are prevented from completing the course by a severe, unexpected event. Simply being behind work is not a reason for an Incomplete, though; in that case you should consider dropping the course.

*S/U grades:* If you are registered S/U your grade will be ‘S’ if your letter grade is C or above, and ‘U’ otherwise.

## Policies

*Academic integrity:* The usual rules of academic integrity apply. In particular, the Aggie Honor Code “An Aggie does not lie, cheat or steal, or tolerate those who do” should be self-evident, see

<http://aggiehonor.tamu.edu/>

Students may, and are encouraged to, work together and discuss homework problems with each other. However, copying work done by others is an act of scholastic dishonesty and will be persecuted to the full extent allowed by University policy.

*Disabilities:* If you have a disability and need special assistance, please contact me so we can make accommodations. The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please also contact Services for Students with Disabilities, Cain Hall, Room B118, 845-1637.

For other policies and other information, please read

<http://www.math.tamu.edu/courses/>