OR 644
Nonlinear Programming

Spring 2007, Tuesday 4:30-7:10,

Robinson B124

Professor

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Text

Stephen G. Nash and Ariela Sofer, Linear and Nonlinear Programming, McGraw-Hill, (1996).
Note: The book is temporarilly out of print. You may still get some copies over the internet. Alternatively I will make copies of the chapters that we will need. Students who use this option will have to pay for the cost of the copying. (Buying the book is the better deal.)

Course description

Nonlinear programming problems arise in a wide variety of applications, such as engineering design, finance, energy modeling, and medical diagnosis and treatment. This course provides an introduction to the theory and methodology of nonlinear programming. After a review of the required mathematical background, we will study the theory of unconstrained optimization. We will then discuss methods for minimizing unconstrained functions, including Newton's method, the steepest descent method, the conjugate gradient method and truncated Newton methods, and will discuss the merits and disadvantages of each of these methods. We will continue to study the theory of constrained optimization, and then discuss methods for constrained optimization, including active set methods and penalty and barrier methods.

Throughout this course we will solve a number of applied nonlinear programming problems using a variety of optimization software packages. The packages differ in the algorithm they use to solve the nonlinear programs, and one of our our goal will be to compare the

performance of different algorithms on specific problems. The front end to these software packages will be the modeling language AMPL. The software itself can be downloaded here. Throughout the course we might also experiment with the modeling language AIMMS A variety of nonlinear solvers may be accessed via the internet through the NEOS Server.

Grading

There will be an in-class midterm examination, and a take-home final. Each of these will be worth 25% of the grade. The midterm exam will be open book, open notes. Homeworks will be assigned regularly in the first half of the semester, but only occasionally in the second half. Instead, students will have to complete two projects. These projects will involve solving via a variety of nonlinear optimization algorithms, using AMPL as the modeling language. The homeworks will make up 20% of the grade. and the two projects will make up 30% of the grade. In computing the final grade, the lowest homework grade will be dropped.

Homework to date

Class Schedule

Exam Dates

Midterm: Tuesday, March 27
Final exam due: Tuesday May 8, 5:00 pm

Fundamental rules

- Make-up exams will *only* be given for extreme situations, and *only* if I am contacted before the exam is given and full arrangements are established. Full adherence to this policy is the responsibility of the student.
- The exam dates above are tentative, and it is the students responsibility to keep abreast of changes.
- Homework will be assigned each class, and usually collected. All work must be clearly written. Illegible work will not be accepted.
- There will be a penalty of 10% of the total grade for every day homework is late.

Other information

Getting a computer account

SITE Computer Labs (schedules, software, etc.)