Instructor Marina A. Epelman, mepelman@umich.edu
GSI Katharina Ley, katley@umich.edu
Office hours: see CTools web site for current info

Lectures: Mondays and Wednesdays, 9:00 – 10:30AM, IOE 1680.

Readings: required text: D. Bertsimas and J.N. Tsitsiklis, “Introduction to Linear Optimization,” Athena Scientific, and additional course materials distributed either in class or through the course web page.

There are many good textbooks on linear programming. If you are looking for complementary reading, or future references, the following books cover the introductory concepts on a similar (graduate) level to this course:

- M.S. Bazaraa, J.J. Jarvis, and H.D. Sherali, “Linear Programming and Network Flows”
- Vasek Chvatal, “Linear Programming”
- Katta Murty, “Linear Programming”
- Romesh Saigal, “Linear Programming: a modern integrated analysis”

The following book combines an introductory textbook in Linear Programming and a manual of the AMPL modeling language we will occasionally use in our computational work:


Catalog description: Formulation of problems from the private and public sectors using the mathematical model of linear programming. Development of the simplex algorithm; duality theory and economic interpretations. Post-optimality (sensitivity) analysis application and interpretations. Introduction to transportation and assignment problems; special purpose algorithms and advance computational techniques. Students have opportunities to formulate and solve models developed from more complex case studies and to use various computer programs.

Informal description: The catalog description provides a good account of the topics we will cover. Speaking more broadly, the goal of this course is to discuss Linear Programming as a mathematical technique to model decision and optimization problems relevant in engineering, various industries and other applications, as well as methods for solving the resulting models and interpret the solutions. Since Linear Programming bridges the fields of engineering and applied and pure mathematics, this course will cover, and ask you to perform in homeworks and exams,

- development of mathematical models of real problems, both on paper and through computer modeling languages,
- rigorous proofs of mathematical results,
- development and analysis of algorithmic methods for solving linear programming problems,
- presentation of your ideas and solutions in precise language, correctly using appropriate technical terms and other terminology.
**Required background:** Linear algebra (sec. 1.5 of the book) and mathematical maturity (ability to follow, and develop, a rigorous mathematical argument).

In addition, many homeworks will include some computational problems. These will consist of coding linear programs with AMPL modeling language and solving them with appropriate solver software; all the software is available on CAEN workstations.

**Grading:** final exam (35%), weekly homework (25%), and two midterms (20% each).

**Homeworks:** Weekly homework assignments will be posted on the web a week before the due date, and due in class, or in the GSI’s mailbox no later than 12:30 PM on the date specified (typically on Wednesdays). Solutions to the homework assignments will be posted on the web on the due date. Late assignments will not be accepted for any reason, but we will drop your lowest-scored homework from the calculation of your course grade.

You are *strongly* encouraged to type, rather than handwrite, your homework solutions. Remember that your score depends in part on the clarity of your presentation of your ideas, and a typed solution is easy to edit and revise to improve it. A popular system for typing up documents containing mathematical notation is **LaTeX** — there will be some sample **LaTeX** documents for those who would like to learn it on the course website.

**Exams:** Midterm exams will take place during regular class time. The first exam is tentatively scheduled for 10/13, and the second will take place on 11/17, 11/22 or 11/24 (exact date will be announced no later than the end of October). Final exam will take place on Monday, December 20, 4:00 – 6:00 PM. Exams. You will be allowed to use a limited number of sheets of *your own* notes only during the exams.
Course Policies and the Honor Code

All students in the class are presumed to be decent and honorable, and all students in the class are bound by the College of Engineering Honor Code. You may not seek to gain an unfair advantage over your fellow students; you may not use unauthorized resources or prohibited forms of collaboration. Any violation of the honor policies appropriate to each piece of course work will be reported to the Honor Council, and if guilt is established penalties may be imposed by the Honor Council and Faculty Committee on Discipline. Such penalties can include, but are not limited to, score deductions, letter grade deductions or expulsion from the University.

Some course policies are provided below; some will be announced for various assignments and examinations as appropriate. If you have any questions about this course policy, please consult the course instructor.

Missed exams and deadlines: Valid excuses for failing to take a midterm or the final at the scheduled time are personal illness or serious illness in your immediate family. Late homeworks will not be accepted.

If you are unable to take an exam for the above reasons, notify the instructor by email or voicemail immediately. You must notify the instructor before the time of the exam to ask for an extension. Misrepresentation of information in such requests is an Honor Code violation. In each instance, the extension or other accommodations are up to the instructor to grant, and you must follow the arrangements made to make up for the missed work.

Individual work policies: You are allowed (indeed, encouraged) to consult with other students currently enrolled in the class during the conceptualization of a homework problem, or ask for technical support from others (e.g., CAEN staff) in accessing the necessary software. However, each student must solve all the problems herself or himself (including creating all computer files and performing all computer calculations), and submit an individual write-up of the homework. Past experience clearly shows that students who discuss the material with other students are better able to express their understanding of the course materials during exams. However, there is a vast gap between being able to read and understand a solution and being able to create and write one.

Copying, or rephrasing, of someone else’s written work or computer work is unacceptable. In particular, you are not allowed to obtain, look at, use, or in any way attempt to derive advantage from the existence of solutions for this or other classes prepared in prior years, whether these solutions were produced by former students or had been made available by previous or current instructors or textbook publishers.

Online materials: Many materials in this course are made available to you online through CTools. You can print out and/or save these files for your personal use. However, you should not distribute these materials to others (e.g., by uploading them on other web sites) without obtaining permission of the copyright holder.