Optimization II (ORIE 3310/5310)
Spring 2013

Instructor: Mutiara (Tia) Sondjaja
Email: ms999@cornell.edu
Office hours: Rhodes 257, T 10:30am-12:30pm and Th 12:30-2:30pm

Teaching Assistants: Pat Steele (prs233), Nanjing Jian (nj227), Yixuan Zhao (yz645),
Erika Hoppner (emh99), Jun Yang Chua (jc954), Deborah Chu (dsc222)
Office hours: TBA (check blackboard site)

Lecture: Tuesday and Thursday, 8:40-9:55am, Hollister B14
Discussion: Tuesday, 2:30 - 4:25pm, Rhodes 453
Wednesday, 12:20 - 2:15pm, Rhodes 453
Wednesday, 2:30 - 4:25pm, Rhodes 453
Friday, 2:30 - 4:25pm, Rhodes 453

1 Learning goals

1. This course aims to introduce you to a breadth of optimization topics: problems and algorithms beyond basic linear programming and simplex method. We will analyze the problems and algorithms, to try to understand the importance of problem assumptions and to understand why these algorithms work and how efficient they are. As importantly, we will learn how to apply these models and algorithms to actual problems.

2. So, besides “covering the topics”, we hope that this course helps you build your optimization muscles (which include being able to think critically about problems and their solutions) so that you will be ready when confronted with new or real-life optimization problems in the future.

2 Outline of topics

Network optimization Minimum-cost network flow, maximum flow, Ford-Fulkerson algorithm; the shortest-path problem; the assignment problem, the Hungarian algorithm

Dynamic programming Bellman equation, principle of optimality; applications to the knapsack problem, the shortest-path problem, inventory planning; stochastic dynamic programming

Integer programming Formulation and modeling; Branch and bound, cutting planes, constraint generation for solving large-scale problems

Nonlinear optimization Newton’s Method, KKT condition, Interior-point method

AMPL will be used extensively throughout the course.
3 Academic integrity

You are expected to maintain the highest level of academic integrity in the course. This includes submitting your own work for homework, recitation exercises, and exams. Cheating and submitting someone else’s work will not help your learning, and will be penalized according to the Cornell academic integrity code: [http://cuinfo.cornell.edu/Academic/AIC.html](http://cuinfo.cornell.edu/Academic/AIC.html).

If you have any concerns about your learning, grades, or progress in the course, or if you have other difficulties, feel free to talk to me or any of the TAs. Other resources at Cornell are also available [http://caringcommunity.cornell.edu/](http://caringcommunity.cornell.edu/).

4 Course logistics

4.1 Prerequisites

The prerequisites for this course are comfort with linear algebra and knowledge of ORIE 3300/5300 material, which include: linear programming formulation, the simplex method, and related topics such as sensitivity analysis and linear programming duality. Familiarity with AMPL is recommended, but we will review it in the first week’s recitation.

4.2 Course website (Blackboard)

The blackboard site will contain all of the information that you need in this course, including staff information and office hours, lecture notes, homework assignments and solutions, exam preparation material, and your homework and exam grades. Make sure that you are enrolled on the course blackboard site and that you check the site regularly for updates and new material.

4.3 Required Textbooks

**Optimization 2 course notes** (written by David Shmoys and Adrian Lewis, 2007). We will treat this document, which is available on blackboard, as a textbook. In general, I will structure my lectures in line with these notes, although the detail (such as numerical examples) might differ.

**AMPL: A Modeling Language for Mathematical Programming** You can buy the hardcopy, but it is now also available for free on the AMPL website: [http://www.ampl.com/BOOK/download.html](http://www.ampl.com/BOOK/download.html)

4.4 i>clicker

You are required to purchase an i>clicker and to bring it to every lecture, for in-class short quizzes. These quizzes won’t be graded, but will be accounted for attendance purposes. After you purchase your i>clicker, please register it on blackboard:
1. Login to Blackboard at http://blackboard.cornell.edu
2. Under your list of "My Courses" click on the name of the course using i>clickers.
3. Click on the "Tools" button in your Course Menu.
4. Click on "i>clicker Remote Registration".
5. Type in the i>clicker Remote ID on the back of your clicker. Click Submit.

NOTE: Registering your clicker for one Blackboard course will automatically register your clicker for ALL Blackboard courses each semester. Please do not register i>clickers at the iclicker.com site.

5 Assessments and Grades

Course grade will be based on homework sets, two prelim exams, one final exam, and lecture and recitation attendance:

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Prelim 1</td>
<td>20%</td>
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<tr>
<td>Prelim 2</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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<tr>
<td>Lecture Attendance</td>
<td>5%</td>
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<tr>
<td>Recitation Exercises</td>
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<td><strong>Total</strong></td>
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5.1 Homework

Submitting homework Weekly homeworks will be posted on Blackboard and are due at noon on Fridays. They should be submitted through the homework box labelled “ORIE 3310/5310”, which is located by the elevators on the second floor of Rhodes Hall. In general, email submissions are not accepted and broken printers is not an excuse.

Late homework Each student will have two “late homework dollars” (LH$’s) throughout the semester. To use an LH$,

- you must email me (ms999) by 1pm on the day the homework is due.
- Each LH$ gives you a homework extension until noon the following Monday.
- I will keep track of the number of LH$’s you have used in the gradebook on Blackboard.
- Note that any homework that is submitted after the TA’s have emptied the homework box is counted as late.

Besides these, absolutely no late homeworks will be accepted. Use your LH$’s wisely!

Dropped homework grade One lowest homework grade will be dropped. If you don’t submit a homework, it will be given a zero and can be the dropped homework.

Graded homework can be picked up in your discussion section.
Regrade request If you found that your graders made a grading mistake, clearly describe your request for regrade on a sheet of paper, which you must staple to the front your original homework. Hand this request to your TA before you leave your discussion section (request must be made on the same day the homework is handed back to you).

Solutions Homework solutions will be posted on blackboard after noon on Monday.

5.2 Exams

Exams are cumulative, and will take place on the following dates:

- Prelim 1 Thursday, Feb 21, 7:30-9:00pm (location TBA)
- Prelim 2 Tuesday, April 9, 7:30-9:00pm Hollister B14
- Final Exam Thursday, May 16, 2:00-4:30pm (location TBA)

5.3 Lecture Attendance and Recitation Exercises

Lecture Attendance You are required to attend lectures are discussion sections. Attendance during lectures will be taken via i>clickers questions.

Recitation Exercises There will be a computing exercise which you must submit at the end of each recitation. Each exercise can be done individually or in pairs and will be graded out of two points, based on attendance and effort. Choose one section to try to attend regularly throughout the semester so that you can get to know and to be known by your TA.