EBGN 556 - Network Models

Spring 2013

Lectures	Monday, Wednesday	2:00pm - 3:15pm	211 Engineering Hall
Instructor	A. M. Newman		
	Office:	319 Engineering Hall	
	Office Hours:	Monday	10:45am-11:15am
		Tuesday	8:00am-9:00am; 5:00pm-8:00pm
		Wednesday	10:45am-11:15am
	email:	newman@mines.edu	
Teaching	Gavin Goodall		
Assistant	Office:	212 Engineering Hall and EB Computer Lab	
(TA)	Office Hour:	Monday	11:30am-12:30pm

GENERAL INFORMATION

- **Textbooks:** *(recommended)*
  - ⋆ R. Ahuja, T. Magnanti, and J. Orlin *Network Flows*, Prentice Hall, 1993.
  - ⋆ Fourer, Gay, Kernighan. *AMPL: A Modeling Language For Mathematical Programming*, Thompson, 2003.
- **Assignments:** There will be a weekly assignment due Wednesday (the following week). The TA will grade the homework, so direct homework grading questions to him. *Do not send email to the TA!!*
- **Project:** There will be a project involving formulating, solving and analyzing a challenging problem, writing code, and/or performing a literature review. The project group may consist of between one and four students. The project will be due during finals week.
- **Exams:** There will be a midterm and a final examination. Both are open book. You must wait 48 hours after the exam has been handed back to ask (me) any grading questions.

- **Grading:**
  - ⋆ Class Participation: 5%
  - ⋆ Homework Assignments: 20%
  - ⋆ Project: 25%
  - ⋆ Midterm: 20%
  - ⋆ Final: 30%

  Grading is done on a curve where 90% is sufficient but not necessarily necessary for an A-, 80% is sufficient but not necessarily necessary for a B-, etc.

COURSE OUTLINE

- **I. Background**
  - ⋆ Differentiation between networks and linear programs
  - ⋆ Basic definitions, e.g., nodes, arcs
  - ⋆ (Early) motivation for studying network problems
- **II. Spanning Trees**
  - ⋆ Mathematical formulation
  - ⋆ Applications
  - ⋆ Kruskal's algorithm (including optimality conditions and complexity)
- **III. Shortest Path Problems**
  - ⋆ Mathematical formulation
  - ⋆ Applications
  - ⋆ Dijkstra's algorithm, label correcting algorithm (including optimality conditions and complexity)
  - ⋆ All-pairs shortest path problem
- **IV. Maximum Flow Problems**
  - ⋆ Mathematical formulation
  - ⋆ Applications
  - ⋆ Maximum flow-minimum cut theorem

- ⋆ (Shortest) augmenting path algorithm (including optimality conditions and complexity)

- **V. Minimum Cost Flow Problems**
  - ⋆ Mathematical formulation
  - ⋆ Applications
  - ⋆ Network simplex algorithm (including optimality conditions and complexity)

- **VI. Other Network Problems**
  - ⋆ Transportation and assignment problems
  - ⋆ Maximum weight closure problem

- **VII. When Networks Become Integer Programs**
  - ⋆ Networks with side constraints, e.g., generalized assignment, multicommodity flow
  - ⋆ Matching problem
  - ⋆ Routing problems, e.g., traveling salesman

RULES

- Please do not send email regarding homework problems; come to office hours instead.
- Statute of limitations for questions about grading is one week from the student's receipt of the graded work.
- I do not want to see or hear your cell phone. Ever. This includes during office hours.
- No rudeness of any kind towards anyone in the class will be tolerated.
- Do not talk to your neighbor during class.
- You may confer with others regarding the homework and project, but the work you hand in must be your own. Please ensure it is done neatly.
- Attendance in class is required. Be on time.
- Any alternate arrangements for exams must be submitted in writing at least one week in advance of the exam. Any additional arrangements regarding disabilities must be *formally* and *legally* documented and approved.

A minor infraction of the above rules will result in a warning. A major infraction will result in expulsion from the class.