EBGN 456 - 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
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Teaching Assistant: Gavin Goodall
Office: 212 Engineering Hall and EB Computer Lab
Office Hour: Monday 11:30am-12:30pm

GENERAL INFORMATION

- Textbooks: *(recommended)*
  

- 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 an *optional* 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%

or

  * Class Participation: 5%
  * Homework Assignments: 25%
  * Midterm: 30%
  * Final: 40%

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.