Instructor: Tamon Stephen
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Meeting Time: Monday 2:30–4:20 and Wednesday 2:30–3:20 in SUR 3350
Office Hours: Wednesday 3:30–4:20 (tentative) and by appointment.
Text: Network Flows by Ahuja, Magnanti and Orlin
Grading: **448**: 20% Homework, 30% Midterm, 50% Final.
748: 20% Homework, 20% Presentation, 20% Midterm, 40% Final.

1. **Syllabus.** Our focus will be on the first ten chapters of the text. Time permitting, we will also cover parts of chapters 14, 15 and 17 and some applications. Topics that we plan to cover include:

   Network flow models and applications, developing polynomial time algorithms, flow decomposition theorems.

   Shortest path algorithms: Review of Dijkstra's algorithm and implementations, label correcting algorithms and special implementations, detection of negative cycles.

   Maximum flows: Review of augmenting path algorithms labeling algorithms, labeling algorithm and maximum flow minimum cut theorem, capacity scaling, pre-flow push algorithms, flows in unit capacity networks.

   Minimum cost flows: Optimality conditions and duality, cycle-canceling algorithm and minimum mean cycle canceling, capacity scaling algorithm.

   Convex cost flows and transformation to minimum cost flows, generalized network flow models and properties of basic feasible solutions, multi-commodity network flow models.

   Additional applications of network flow models.

2. **Graduate student projects.** Near the end of the term, graduate students will each give a presentation on a research paper from the mathematical literature in class. The presentation should describe the results in the paper, as well as their context, and should be at a level where it will be understood by undergraduate and graduate students in this class. There may be an option to give these presentations at the SFU Operations Research Seminar series rather than in class. The papers will be chosen in conjunction with the instructor.

3. **Homework.** There will be five homework assignments during the term. Late homework will not be accepted.

   You are encouraged to talk with each other and the instructor about the homework, but you must write up the solutions yourself, using your own words.

4. **Reading.** There will be assigned reading. Please do it.

5. **Exams.** Books, notes and calculators cannot be used on these tests. Students **must** plan to take the tests at their scheduled times.

   The tentative dates and times for the tests are:

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   Midterm: Monday, March 5th, 2:30-4:20 PM  (in class)
   Final: Wednesday, April 18th 12:00-3:00 PM
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6. **Religious Accommodations.** Students requesting religious accommodation must tell the instructor by the end of the first week of term.

7. **Reserve Books.** There is a copy of the course text on reserve at the SFU Surrey library. Additionally, you will find Schrijver's excellent reference *Combinatorial Optimization*. Two older textbooks that cover some of the same material (by Murty; and Jensen and Barnes) are also on reserve.

   Several texts that cover linear programming are part of the Math 308 course reserves. Several of these contain extensive and helpful treatments of network flows, including those of Chvátal; Vanderbei; Bazraa, Jarvis and Sherali; Strayer; and Kolman and Beck.

8. **Questions.** Questions are encouraged in class and out.

Have a great term!