EBGN557 - Integer Programming

Fall 2014

Lectures	Tuesday, Thursday	8:00am - 9:15am	326 Marquez Hall
Instructor	A. M. Newman		
	Office:	312 Brown Building	
	Office Hours:	Tuesday	10:50am-11:50am
			3:00pm-3:55pm
		Wednesday	6:00pm-9:00pm (+BB340)
	email:	newman@mines.edu	
Teaching	Ben Johnson		
Assistant	Office:	W378 Brown Building	
(TA)	Office Hour:	Wednesday	1:00pm-2:00pm

GENERAL INFORMATION

- **Credit**: This course is a three-hour lecture and credit-hour class. It is required for Operations Research with Engineering PhD students and is an elective in other programs; please consult your program of study for further details.

- **Textbooks:**

  - ⋆ R. Rardin. *Optimization in Operations Research*, Prentice Hall, 1998 (optional).

  - ⋆ Fourer, Gay, Kernighan. *AMPL: A Modeling Language For Mathematical Programming*, Thompson, 2003 (optional).

  - ⋆ Martin. *Large Scale Linear and Integer Optimization*, Kluwer Academic Publishers, 1999 (optional).

- **Blackboard:** There is a blackboard site for this course, listed as EBGN557, Integer Programming. The bulletin description, policy on academic integrity and misconduct, solution sets, class handouts, and grades can be found there.

- **Assignments:** There will be a weekly assignment, handed out on Thursday every week due the following Thursday in class the following week, and handed back (graded) the Tuesday after that. Please direct any homework grading questions to the TA, who will be grading the homework assignments. *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 and should relate to your thesis work, if applicable.

- **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[1]

- **I. Integer Programming Formulations**

  ⋆ Textbook applications

  ⋆ Real-world case studies

- **II. Tractability of Integer Programming Models**

  ⋆ Total unimodularity

  ⋆ Network models versus integer and linear programs

- **III. Branch-and-bound**

  ⋆ The "vanilla" algorithm and its complexity

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[1]Students will be required to know the following material as the "learning outcome" of the class.

⋆ Reading the node log from a computer

- **IV. Cutting Planes and Strong Formulations**

　　　⋆ Valid and useful inequalities

　　　⋆ Tightening a formulation

　　　⋆ Algorithmic parameter settings

- **V. Lagrangian Relaxation**

- **VI. Benders Decomposition**

- **Computer Implementation**

　　　⋆ Model implementation will be emphasized throughout the course (using AMPL as a modeling language – as in EBGN555, 556, and 552).

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.

- Do not harass the TAs.

- 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.

- Please sit in the front half of the classroom.

- 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.