COLORADOSCHOOLOFMINES

Subject: Optimization Number: EBGN 555

Course Title: Linear Programming

Section: A

Semester/year: Fall 2014

Instructor or Coordinator: Steffen Rebennack

Contact information (Office/Phone/Email): EH 310 / 303-273-3925 / srebenna@mines.edu

Office hours: TBD

Class meeting days/times: TR / 12:30 pm – 1:45 pm

Class meeting location: GC 265

Web Page/Blackboard link (if applicable): -

Teaching Assistant (if applicable): TBD

Contact information (Office/Phone/Email): TBD

Office hours: TBD

Instructional activity: _3_ hours lecture _0_ hours lab ___ semester hours

Course designation: ___ Common Core ___ Distributed Science or Engineering

___ Major requirement _X_ Elective ___ Other (please describe _____)

Course description from Bulletin:

This course addresses the formulation of linear programming models, examines linear programs in two dimensions, covers standard form and other basics essential to understanding the Simplex method, the Simplex method itself, duality theory, complementary slackness conditions, and sensitivity analysis. As time permits, multi-objective programming and stochastic programming are introduced. Applications of linear programming models discussed in this course include, but are not limited to, the areas of manufacturing, finance, energy, mining, transportation and logistics, and the military.

Prerequisite: MATH111; MATH332 or EBGN509; or permission of instructor.

Textbook and/or other requirement materials:

Required text: *Linear Programming and Network Flows*, by M.S. Bazaraa, J.J. Jarvis and H.D. Sherali, 4th edition, Wiley.

Student learning outcomes: At the conclusion of the class students will…

1. be able to recognize and formulate a linear programming problem,
2. master the basic theory of linear programming, and
3. have a sound background on the solution methods used.

Brief list of topics covered:

1. Linear Programming fundamentals
2. The Simplex method
3. The initial basic feasible solution
4. Degeneracy, cycling, and stalling
5. Complexity of the Simplex algorithm
6. Duality and sensitivity analysis
7. The dual Simplex method
8. The primal-dual method

Policy on academic integrity/misconduct: The Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining an fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student's academic achievements, and giving credence to the university's educational mission, its scholarly objectives and the substance of the degrees it awards. The protection of academic integrity requires there to be clear and consistent standards, as well as confrontation and sanctions when individuals violate those standards. The Colorado School of Mines desires an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times.

Academic misconduct is the intentional act of fraud, in which an individual seeks to claim credit for the work and efforts of another without authorization, or uses unauthorized materials or fabricated information in any academic exercise. Student Academic Misconduct arises when a student violates the principle of academic integrity. Such behavior erodes mutual trust, distorts the fair evaluation of academic achievements, violates the ethical code of behavior upon which education and scholarship rest, and undermines the credibility of the university. Because of the serious institutional and individual ramifications, student misconduct arising from violations of academic integrity is not tolerated at Mines. If a student is found to have engaged in such misconduct sanctions such as change of a grade, loss of institutional privileges, or academic suspension or dismissal may be imposed.

The complete policy is online.

Grading Procedures: The homework assignments count collectively for 25% of the grade. Homeworks are weighted equally.

We will have a Mid-Term exam counting for 25% of the grade, plus a final exam that will count for 30% of the grade. The final exam will be comprehensive and will cover all the material.

The class project (individual project, not a team project) counts for 20% of your final grade.

The final (letter) grade will be determined by considering absolute scores. Specifically, the final grades will be given according to the following table:

93 – 100%	A
90 – 92%	At least A-
87 – 89%	At least B+
83 – 86%	At least B
80 – 82%	At least B-
77 – 79%	At least C+
73 – 76%	At least C
70 – 72%	At least C-

Coursework Return Policy: All homework, exams and the project will be graded within 2 weeks.

Absence Policy (e.g., Sports/Activities Policy): Class attendance is voluntarily.

Homework, Project, Software and Exam make-up:

- Homework must be turned in before it is due to be graded – plan ahead.
- There will be 10 homework assignments, usually due on a Thursday beginning of class. Teamwork is encouraged, but submission has to be individual.
- There will be a class project. The topic of the project is broadly defined as "Linear Programming". You are expected to write a paper, following the standard template of the scientific literature. Your paper is graded with the following key: writing (25%), LP relevance (25%) and novelty/contribution (50%). The paper will be due in the week before the exam week.
- We are going to use the algebraic modeling language GAMS. You can download the software for free at http://gams.com/download/ . The test license allows the usage of the software for free but limits the problem size. A full version is available at one of the Mines servers. I will grant you access if needed.
- I will hand out typed class notes. These notes cover the basic material covered in the class. They are not comprehensive. The class notes are also available for download on blackboard.
- *Exams*: If you will be absent during a scheduled exam, you should schedule a make-up time before you leave.

Common Exam Policy (if applicable): n/a

Detailed Course Schedule:

Date		Topic	HW	Project
Tues.	08/19	Introduction	-	-
Thur.	08/21	Introduction: Thermal expansion	-	-
Tues.	08/26	Introduction: Hydro scheduling	-	-
Thur.	08/28	Introduction: Graphical solution & GAMS	HW I due	-
Tues.	09/02	Fundamentals	-	-
Thur.	09/04	Fundamentals	HW II due	-
Tues.	09/09	Fundamentals	-	-
Thur.	09/11	Fundamentals	HW III due	-
Tues.	09/16	The Simplex method	-	-
Thur.	09/18	The Simplex method	HW IV due	-
Tues.	09/23	The Simplex method	-	-
Thur.	09/25	The Simplex method	HW V due	-
Tues.	09/30	The Simplex method	-	-
Thur.	10/02	The Simplex method	-	-
Tues.	10/07	Starting solution and convergence	-	-
Thur.	10/09	*Mid-term exam*		
Tues.	10/14	Fall break – no class		
Thur.	10/16	Starting solution and convergence	-	-
Tues.	10/21	Starting solution and convergence	-	-
Thur.	10/23	Starting solution and convergence	HW VI & VII due	-
Tues.	10/28	Starting solution and convergence	-	-
Thur.	10/30	Starting solution and convergence	HW VIIII due	-
Tues.	11/04	Starting solution and convergence	-	-
Thur.	11/06	Starting solution and convergence	HW IV due	-
Tues.	11/11	Duality and sensitivity analysis	-	-
Thur.	11/13	Duality and sensitivity analysis	HW X due	-
Tues.	11/18	Duality and sensitivity analysis	-	-
Thur.	11/20	Duality and sensitivity analysis	-	-
Tues.	11/25	Duality and sensitivity analysis	-	-
Thur.	11/27	Thanksgiving – no class		
Tues.	12/02	Duality and sensitivity analysis	-	-
Thur.	12/04	Open problems in Linear Programming	-	Paper due
	TBA	*Final exam*		