COLORADOSCHOOLOFMINES

Subject: EBGN Number: 409/509

Course Title: Mathematical Economics

Section: 1

Semester/year: Fall 2016

Syllabus date: 08/22/16. Syllabus may be updated as the semester progresses.

Instructor or Coordinator: Peter Maniloff

Contact information (Office/Phone/Email):

Office: Engineering Hall 323

Phone: (303) 273-3481

Email: maniloff@mines.edu

Office hours: Tuesdays, 3:00-4:30, and by appointment. Grad assistant: TBD

Class meeting days/times: Tuesdays and Thursdays, 9:30-10:45

Class meeting location: Marquez 126

Web Page/Blackboard link (if applicable): https://blackboard.mines.edu/

Teaching Assistant (if applicable):

Contact information (Office/Phone/Email):

Instructional activity: _3__ hours lecture __0_ hours lab _3__ semester hours

Course designation: ___ Common Core ___ Distributed Science or Engineering

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

Course description from Bulletin:

This course reviews and re-enforces the mathematical and computer tools that are necessary to earn a graduate degree in Mineral Economics. It includes topics from differential and integral calculus; probability and statistics; algebra and matrix algebra; difference equations; and linear, mathematical and dynamic programming. It shows how these tools are applied in an economic and business context with applications taken from the mineral and energy industries. It requires both analytical as well as computer solutions. At the end of the course you will be able to appreciate and apply mathematics for better personal, economic and business decision making. Prerequisites: Principles of Microeconomics, MATH111; or permission of instructor

Textbook and/or other requirement materials:

Required text: Alpha C. Chiang and Kevin Wainwright, 2005, Fundamental Methods of Mathematical Economics, 4th edition

Other required supplemental information: Shaum's Outlines: Introduction to Mathematical Economics

Lectures will follow Chiang and Wainwright relatively closely, though I will likely emphasize certain topics over others if I feel they are more useful/relevant/important. I highly encourage you to read the assigned chapters prior to class, as lectures will be substantially more useful. As this is a graduate level course, you should consider the book your primary source of learning, with lectures serving to clarify and supplement your readings. Fortunately, I find the book to be quite good at providing explanatory text and examples, so I think you'll get a lot out of even the more technically challenging chapters. If you are someone who finds examples to be of great use, I would highly recommend Shaum's Outlines which contains hundreds of problems with solutions.

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

1. Be prepared to engage with economic research
2. Have a basic understanding of the role of mathematics and mathematical modeling in economics
3. Be prepared for further graduate study in economics

Brief list of topics covered:

1. Linear models and matrix algebra
2. Comparative statics and implicit functions
3. Optimization
4. Constrained optimization
5. Dynamic optimization and optimal control theory
6. Game theory

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:

HW	25%
Quizzes	25%
Final Exam	40%
Class Participation	10%

Class participation – I will expect all students to be active and respectful participants in class. This includes sharing ideas and respecting the ideas of others. If you have questions, please see this website for a variety of ideas on how to productively participate: https://www.princeton.edu/mcgraw/library/for-students/class-participation-contr/ In my classroom, I expect all participants to treat each other with respect to one another without regard to individual identity or presentation.

The **exam** will be closed book, though you may bring a 3x5 index card with doubled-side notes on it. Quizzes will cover the material preceding the test date, while the exam will be comprehensive.

Students enrolled in 409 have the option to design a mathematical model of an economic system in lieu of the final exam. Please speak to me outside of class if you are interested. I will post details midsemester.

Homework: There will be approximately 9 HW sets assigned over the course of the semester. You will typically have a week to complete the assignments. Working in groups is fine, though I expect solutions from everyone. Working through problems is the most effective way to learn this material, so it is in your best interests to be able to competently solve these problems on your own. HW sets will be graded on a 0-10 scale. I'm looking for both clear and correct solutions.

I will drop your lowest single homework grade.

Unless otherwise noted, homework assignments will be due at the beginning of the morning class session.

Quizzes will be 10-20 minutes at the beginning of class. There will be approximately 6 quizzes through the semester. They will be closed book, closed notes. If you are doing the reading and homeworks as scheduled, the quizzes should be straightforward.

Coursework Return Policy: Graded quizzes and homeworks will typically be returned within 1 week.

Absence Policy (e.g., Sports/Activities Policy): We will follow standard university procedures for university-related absences.

Homework:

- Homework must be turned in before it is due to be graded – plan ahead.
- Exams: If you will be absent during a scheduled exam, you should schedule a make-up time before you leave.

Detailed Course Schedule:

Class	**Date**	**Lecture Topic**	**Reading (#'s mean chapter)**	**HW**
1	T 8/23	Introduction and Economic Models	1,2	PS #1 (due 9/1)
		Static/Equilibrium Analysis		
	R 8/25	No class		
2	T 8/30	Equilibrium analysis in economics	3,4 handout	
3	R 9/1	Linear models and matrix algebra	5	PS #2 (due 9/8)
4	T 9/6	Linear models and matrix algebra	5	

		Comparative Static Analysis		
5	R 9/8	The concept of the derivative, Rules of differentiation and their use in comparative statics	6,7	PS #3 (due 9/15)
6	T 9/13	No class – go to the career fair		
7	R 9/15	Comparative-Static analysis of General-function models	8	Quiz ch 1-5
8	T 9/20	Comparative-Static analysis of General-function models	8	PS #4 (due 9/29)
		Optimization		
9	R 9/22	Optimization: A special variety of equilibrium analysis	9	
10	T 9/26	Optimization: A special variety of equilibrium analysis	9	PS #5 (due 10/4)
11	R 9/29	Exponential and logarithmic functions	10	Quiz ch 6-8
12	T 10/4	Multivariable optimization	11	PS #6 (due 10/11)
13	R 10/6	Multivariable optimization	11	
14	T 10/11	Multivariable optimization	11	PS #7 (due 10/20)
15	R 10/13	Constrained Optimization with equality constraints	12	
	T 10/18	No class – fall break		
16	R 10/20	Constrained Optimization with equality constraints	12	Quiz ch 9-11
17	T 10/25	Constrained Optimization with inequality constraints	13	
18	R 10/27	Constrained Optimization with inequality constraints	13	
19	T 11/1	Constrained Optimization with inequality constraints	13	
20	R 11/3	Dynamics and Integral Calculus	14	Quiz ch 12-13
21	T 11/8	Differential Equations	15	
22	R 11/10	Differential Equations	15	PS #8 (due 11/17)

23	T 11/15	Optimal Control Theory	Handout	
24	R 11/17	Optimal Control Theory	Handout	
25	T 11/22	Optimal Control Theory	Handout	
26	T 11/29	Special Topics – Intro to Game Theory		Quiz optimal control
27	R 12/1	Special Topics – Intro to Game Theory		
28	T 12/6	Special Topics – Intro to Game Theory		
29	R 12/8	Review		
		Cumulative exam		