Subject: EBGN      Number: 409

Course Title: Mathematical Economics

Section: 1

Semester/year: Spring 2014

Instructor or Coordinator: Peter Maniloff

Contact information (Office/Phone/Email):

Office: Engineering Hall 117
Phone: (303) 273-3481
Email: maniloff@mines.edu

Office hours: Wednesdays 2-4, after class, and by appointment

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

Class meeting location: Engineering Hall 211

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

Teaching Assistant (if applicable): N/A

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:

Application of mathematical tools to economic problems. Coverage of mathematics needed to read published economic literature and to do graduate study in economics. Topics from differential and integral calculus, matrix algebra, differential equations, and dynamic programming. Applications are taken from mineral, energy, and environmental issues, requiring both analytical and computer solutions using programs such as GAMS and MATHEMATICA. Prerequisites: MATH213, EBGN301, EBGN302; or permission of the instructor. 3 hours lecture; 3 semester hours.

Textbook and/or other requirement materials:


Optional supplemental information: Schaum’s Outlines: Introduction to Mathematical Economics. This book is a basic introduction to mathematical economics with practice problems. Some students find it helpful for learning and practicing mathematical techniques.
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 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:

Final grades will be determined as:

- HW: 15%
- In-class problems: 10%
- In-class presentations: 25%
- Midterm: 25%
- Final Exam: 25%

All exams are closed book, though you may bring a 3x5 index card with double-side notes on it. The midterm will cover the material preceding the test date, while the final will be comprehensive.

Homework: There will be approximately 10 HW sets assigned over the course of the semester. You will typically have a week or more 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 scale of 0-5. To receive a 5, an assignment will be fully correct and with clear explanations.
and a neat and easy-to-follow layout. Largely satisfactory work will receive a 3, while unsatisfactory but submitted work will receive a 1. I am looking for both clear and correct solutions.

**Presentations:** All students will make two in-class presentations on academic research papers.

**In-class problems:** I will regularly ask students to complete examples in class. I will offer help and answer questions. While this example time is primarily an opportunity for student learning, I will grade worked examples.

**Coursework Return Policy:** I will endeavor to return all assignments within two weeks.

**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:**

<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Reading (#’s mean chapter)</th>
<th>HW</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>R 1/9</td>
<td>Introduction and Economic Models</td>
<td>1,2</td>
<td>PS #1 (due 1/16)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Static/Equilibrium Analysis</td>
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<tr>
<td>2</td>
<td>T 1/14</td>
<td>Equilibrium analysis in economics</td>
<td>3,4 handout</td>
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<tr>
<td>3</td>
<td>R 1/16</td>
<td>Linear models and matrix algebra</td>
<td>5</td>
<td>PS #2 (due 1/23)</td>
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<tr>
<td>4</td>
<td>T 1/21</td>
<td>Linear models and matrix algebra</td>
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<td><strong>Comparative Static Analysis</strong></td>
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<tr>
<td>5</td>
<td>R 1/23</td>
<td>The concept of the derivative, Rules of differentiation and their use in comparative statics</td>
<td>6,7</td>
<td>PS #3 (due 2/4)</td>
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<tr>
<td>6</td>
<td>T 1/28</td>
<td>Comparative-Static analysis of General-function models</td>
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<td>7</td>
<td>R 1/30</td>
<td>Comparative-Static analysis of General-function models</td>
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<td><strong>Optimization</strong></td>
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<td>8</td>
<td>T 2/4</td>
<td>Optimization: A special variety of equilibrium analysis</td>
<td>9</td>
<td>PS #4 (due 2/11)</td>
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<td>9</td>
<td>R 2/6</td>
<td>Optimization: A special variety of equilibrium analysis</td>
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<td>10</td>
<td>T</td>
<td>2/11</td>
<td>Multivariable optimization</td>
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<tr>
<td>11</td>
<td>R</td>
<td>2/13</td>
<td>Multivariable optimization (read chapter 10 if you are uncomfortable with logs and exponents)</td>
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<td>12</td>
<td>T</td>
<td>2/18</td>
<td>Multivariable optimization</td>
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<td>13</td>
<td>R</td>
<td>2/20</td>
<td>Constrained Optimization with equality constraints</td>
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<td>Constrained Optimization with inequality constraints</td>
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<td>17</td>
<td>R</td>
<td>3/6</td>
<td><strong>Midterm (Chapters 1-32)</strong></td>
<td>PS #7 (due 3/20)</td>
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<td>18</td>
<td>T</td>
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<td>No class – spring break</td>
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<td>19</td>
<td>R</td>
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<td>18</td>
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<td>3/18</td>
<td>Introduction to dynamics</td>
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<td>19</td>
<td>R</td>
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<td>Differential Equations</td>
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<td>Dynamic Models of Nonrenewable Resources</td>
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