ECONOMICS 113 - MATHEMATICAL ECONOMICS:
GENERAL EQUILIBRIUM THEORY

March 18, 2013
Preliminary, Subject to Change,


Welcome and a Suggestion:  Welcome to Mathematical Economics!  This is a fun and challenging course covering the mathematical foundations of economic theory in the approach known as the Arrow-Debreu model of general equilibrium.  This is probably the most mathematically difficult undergraduate course offered at UCSD Economics.  Before you definitely decide to take the course, it’s a good idea to leaf through the material in sections 1 – 5 of the syllabus.  If the math looks comfortable to you, you’ll probably find the course enjoyable.

Requirements:  There will be weekly problem sets, two midterms, and a final exam.  Feel free to co-operate with friends and classmates on problem sets.  All examinations will be in-class, and are open-book, open-notes.  Confidentiality is required during examinations.  Please strictly observe academic integrity.  Examinations should be your own personal work.  During examinations, other people (classmates, friends, professors --- except the Isla and Prof. Starr) are CLOSED; do not discuss examination materials until after the exam has been collected.

Examination Schedule:
   Midterm 1 (covers syllabus sections 1 to 5).  In Class, Friday, April 19.  Note that Friday April 26 on the Enrollment Calendar is the last day to drop the course without notation on the transcript.
   Midterm 2 (covers syllabus sections 1 to 9 – may be adjusted).  There will be an in-class midterm on Friday, May 24.  Note that Friday, May 31, on the Enrollment Calendar, is the last day to drop the course without recording a grade of “F.”
   Final Exam:  The final exam is scheduled for Wednesday, June 12, 11:30 AM to 2:29 PM.

Grading;  Problem sets, 5%; midterm 1, 15%; midterm 2, 30%; final exam, 50%.

Prerequisites:  A year of calculus and a year of upper division microeconomic theory (at UCSD these courses are Math 20 A-B-C, and Economics 100A-B-C).  Students with very strong mathematics preparation (typically including one quarter of real analysis, UCSD Math 140A or 142A) may enroll without economics prerequisites.
**Lecture Notes on the Web:** Prior to each lecture prepared notes for the lecture will be available on the web. Please have these notes available, and ready for your additional annotation, while you attend the lecture.

**Reserve Materials:** The following items have been requested on reserve:
- Arrow, K. J. and F. H. Hahn, *General Competitive Analysis*
- Cornwall, R. R., *Introduction to the Use of General Equilibrium Analysis*
- Debreu, G., *Theory of Value*
- Eatwell, J., M. Milgate, and P. Newman (eds.) *The New Palgrave: General Equilibrium*

**TOPIC OUTLINE**

Lectures will closely follow Starr's *General Equilibrium Theory: An Introduction*. Please read the relevant portion of Starr's *General Equilibrium Theory* before the topic is covered in class.

**Introduction and Mathematics**

1. The Edgeworth Box (1 lecture)
   - Starr, Preface to 1st & 2nd edition, Foreword,
   - Starr, Chap. 1, 3
   - Optional: Arrow-Hahn, chap. 1
2. Set notation and N-dimensional Euclidean Space (1 lecture)
Starr, Chap. 6, 7 (not including section 7.1)
Optional: Bartle, Section 1, 7, 8, 11
Bartle and Sherbert, 2nd edition section 1.1, chap. 2, sections 3.1, 3.2, 3.3, chap.10; 3rd ed. section 1.1, chap. 2, sections 3.1, 3.4, 11.1, 11.2
Debreu, 1.2, 1.6, 1.9a - 1.9f
Carter, sections 1.1, 1.3, 1.3.1, 1.3.2

3. The Robinson Crusoe Model (1 lecture)
Starr, chapter 2
Optional: Cornwall, 1.1, 1.2, 1.3

4. Continuous Functions (2 lectures)
Starr, section 7.1
Optional: Bartle, Sections 2, 15
Bartle and Sherbert, 2nd ed., sections 5.1, 5.2, 5.3; 3rd ed. sections 5.1, 5.2, 5.3, 11.3
Debreu, 1.3, 1.8
Carter, sections 2.1, 2.1.1 & 2.3

5. The Brouwer Fixed Point Theorem, Convex Sets, and Existence of General Equilibrium in an N-commodity Economy (3 lectures)
Starr, chapters 5, 8 (not including section 8.1)
Optional: Arrow-Hahn, chap. 2
Carter, 1.4.4

Midterm 1 (on Friday April 19) will cover topics 1, 2, 3, 4, 5.

The Arrow-Debreu Model of Economic General Equilibrium

6. Representation of Commodities and Prices, Firms and Producers, (3 lectures)
Starr, chaps. 10, 11
Quirk and Saposnik, 1.7, 2.1, 2.3
Arrow-Hahn, Chapter 3

7. Households, Consumers (3 lectures)
Starr, chaps. 12, 13
Optional: Debreu, Chapter 4
Cornwall, Section 1.4
Quirk and Saposnik, 1.5, 1.6
Arrow-Hahn, 4.1-4.3
Varian, 7.1, 7.2
8. Brouwer Fixed Point Theorem (1 lecture)
   Starr, chap. 9
   Optional: Debreu, Section 1.10
   Nikaido, "Fixed Point Theorems" in *New Palgrave: General Equilibrium.*
   Carter, 2.4, 2.4.1, 2.4.4, 2.4.5

9. Equilibrium (3 lectures)
   Starr, chap. 14, 15, 16, 17, 18.
   Optional: Cornwall, Section 1.6
   Quirk and Saposnik, 1.7, 2.1, 2.3
   Arrow-Hahn, Chapter 5
   Debreu, "Existence of General Equilibrium," *New Palgrave: General Equilibrium*

   McKenzie, "General Equilibrium," *New Palgrave: General Equilibrium*
   Varian, 17.1 - 17.5

Midterm Exam 2 based on topics 1 - 9. Subject to revision.

Welfare Economics

10. Fundamental Theorems of Welfare Economics and Separation Theorems (3 lectures)
    Starr, chapter 4, section 8.1, chapter 19
    Optional: Debreu, Section 1.9.v - 1.9.x,
    Cornwall, Sections 4.1, 4.2, 4.3, 4.5, 8.1.4
    Quirk and Saposnik, 4.4, 4.5
    Varian, 17.6, 17.7, 26.11

11. The Arrow Possibility Theorem (3 lectures)
    Sen, Amartya, “Arrow and the Impossibility Theorem” on the web.

Extending the General Equilibrium Model

12. Equilibrium over Time: Futures Markets (1 lecture)
    Starr, sections 20.1, 20.2
13. Constant Returns and U-Shaped Cost Functions (1 lecture)
   Optional: Starr chapters 23, 24, 25

The final examination will cover topics 1 through 13.