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## **ECONOMICS 113 - MATHEMATICAL ECONOMICS: GENERAL EQUILIBRIUM THEORY**

### **Preliminary – Subject to Revision**

**Requirements:** There will be weekly problem sets, two midterms, a take-home portion of midterm 2 and of the final exam. Feel free to co-operate with friends and classmates on problem sets.

All examinations 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 TA 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 3). In Class, date TBA, probably Thursday, January 21.

Midterm 2 (covers syllabus sections 1 to 7). In Class, date TBA, probably Thursday, February 18 and Take Home due TBA, probably Tuesday, February 23.

Final: There will be a take home section of the final exam, due date TBA. In-class final exam is scheduled for Thursday, March 18, 3:00p - 5:59p (subject to cancellation).

**Grading:** Problem sets, 5%; midterm 1, 15%; midterm 2, 30%; final exam, 50%. Additional credit for class participation.

**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 or 170A-B). The prerequisites may be taken concurrently. Students with very strong mathematics preparation (typically including one quarter of real analysis, UCSD Math 140A or 142A) may enroll without economics prerequisites.

**Text:** R. Starr's *General Equilibrium Theory: An Introduction*, Draft Second Edition available without charge on the web.

**Reserve Materials:** The following items have been requested on reserve:

Arrow, K. J. and F. H. Hahn, *General Competitive Analysis*

Arrow, Kenneth J., "A Difficulty in the concept of social welfare", *Journal of Political Economy*, 58 (1950), pp. 328 - 346. Reprinted in Arrow and Scitovsky, eds., *Readings in Welfare Economics*, 1969.

Bartle, R., *The Elements of Real Analysis*, 1st edition, 1964

- Bartle, R. and D. R. Sherbert, *Introduction to Real Analysis*, 2nd edition, 1992 and 3rd edition, 2000
- Carter, Michael, *Foundations of Mathematical Economics*, 2001
- 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*
- Quirk, J. and R. Saposnik, *Introduction to General Equilibrium and Welfare Economics*
- Starr, R. M., *General Equilibrium Theory: An Introduction*
- Varian, H., *Microeconomic Analysis, 3rd ed.*, 1992
- McCloskey, D. "The Futility of Blackboard Economics" in *The Vices of Economists--The Virtues of the Bourgeoisie*, Amsterdam University Press, 1996.
- Gibbard, A. and H. Varian, "Economic Models" *Journal of Philosophy*, v. 75, 1978, pp. 664-677.

## 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 Brouwer Fixed Point Theorem and Existence of General Equilibrium in an N-commodity Economy (1 lecture)  
Starr, chapter 5, preface to 1<sup>st</sup> & 2<sup>nd</sup> editions (frontmatter)  
Optional: Arrow-Hahn, chaps.1, 2
2. The Edgeworth Box, Set Notation and N-Dimensional Euclidean Space (2 lectures)  
Starr, chapters 3 and 7 (prior to 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 and Continuous Functions (2 lectures)  
Starr, chapter 2 and section 7.1  
Optional: Cornwall, 1.1, 1.2, 1.3  
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

**Midterm 1 will cover topics 1, 2, 3**

The Arrow-Debreu Model of Economic General Equilibrium

4. Representation of Commodities and Prices, Firms and Producers, Convexity (2 lectures)  
Starr, chap. 8 (except 8.3), 10, 11  
Optional: Debreu, Chapter 2, 3  
Geanakoplos "Arrow-Debreu Model of General Equilibrium" in *New Palgrave*.  
Quirk and Saposnik, 1.7, 2.1, 2.3  
Arrow-Hahn, Chapter 3  
Carter, 1.4.4
5. Households, Consumers (2 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
6. 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
7. Equilibrium (2 lectures)  
Starr, chap. 1, 14  
Optional: Debreu, Chapter 5  
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 - 7**

Welfare Economics

8. 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, chap. 6

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

- 9.** The Arrow Possibility Theorem (3 lectures)  
Arrow, Kenneth J., "A Difficulty in the concept of social welfare", Journal of Political Economy, 58 (1950), pp. 328 - 346. Reprinted in Arrow and Scitovsky, eds., Readings in Welfare Economics, 1969.  
"Social Choice" by David Ahn  
"Kenneth J. Arrow (born 1921 - )" by R. Starr

Extending the General Equilibrium Model

- 10.** Equilibrium over Time: Futures Markets (1 lecture)  
Starr, sections 20.1, 20.2
- 11.** Constant Returns and U-Shaped Cost Functions (1 lecture )  
Additional notes TBA  
Optional: Starr chapters 23, 24, 25

**The final examination will cover topics 1 through 11.**