# DEPARTMENT OF ECONOMICS
# MACROECONOMIC THEORY I
## Syllabus 2012

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**Professor:** Caroline Betts
**Office Hours:** Monday 2.00pm - 3.30pm or by appointment
**Office:** Kaprielian Hall 316c
**Email:** cbetts@usc.edu
**TA:** Diego Vilán
**TA Email:** vilan@usc.edu


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### OVERVIEW

This course provides an introduction to the core models and methods of modern macroeconomics and, specifically, to dynamic general equilibrium theory. It emphasizes the learning of some analytical and computational problem solving techniques that are essential to the practice of contemporary macroeconomic analysis. There are two lectures per week, in addition to regular discussion and computer programming sessions that are supervised by the graduate teaching assistant. An outline for the lectures is provided below, and it is followed by a preliminary outline for the discussion sessions. We attempt as far as possible to maintain temporal synchronization of the lecture material and the discussion session material, although that is not always essential or possible. Although there is really no single textbook that is suitable for the course, a selection of textbook references is provided for most sections of the course from which you can choose. The lectures also rely quite heavily on a widely used manuscript published by Dirk Krueger, which is based on graduate macroeconomic theory classes taught at the University of Minnesota.

## TEXTBOOKS

The textbooks for the course from which we will use some specific chapters are:

1. *Recursive Methods in Economic Dynamics* (Nancy L. Stokey and Robert E. Lucas with Edward C. Prescott) Harvard University Press (1989)
2. *Dynamic Macroeconomic Theory* (Thomas J. Sargent) Harvard University Press (1987)
3. *Recursive Macroeconomic Theory* (Lars Ljungqvist and Thomas J. Sargent) The MIT Press (2000)

Some additional books that contain useful chapters are:

4. *Economic Growth* (Robert J. Barro and Xavier Sala-i-Martin) The MIT Press, 2nd edition.

5. *Frontiers of Business Cycle Research* (Thomas Cooley) Princeton University Press (1995)

## PROBLEM SETS

There will be five problem sets assigned throughout the semester which will be graded and returned. Some of the problems will require written and mathematical analysis; others will involve numerical and computational analysis. Answers will either be provided in TA discussion sessions, or in answer guides that will be made available on the teaching assistant's website. Students are encouraged to work together in solving the problem sets. However, each problem set submitted for grading must ultimately be a student's own work. i.e., copying of problem sets is not allowed. All five problem sets must be submitted in order for a final grade for the course to be assigned.

## EXAMINATIONS

There will be a midterm examination, on **Monday, October 15th** in class time, and a final examination on **Friday December 14th from 11am to 1pm**. If you cannot attend the midterm due to a verifiable medical emergency, then the weight of the midterm will be added to the final examination; if you cannot attend the midterm for any other reason, a grade of 0 will be assigned to the midterm. If you cannot attend the final examination due to a verifiable medical emergency, then a makeup examination will be set as soon as possible; if you cannot attend the final exam for any other reason, a grade of 0 will be assigned to the final exam.

## EVALUATION

The exact breakdown of the evaluation of each student's work in the course is as follows:

| | | |
|---|---|---|
| Problem Sets | : | 30% |
| Midterm | : | 30% |
| Final Exam | : | 40% |

No exceptions will be made to this allocation of your final grade.

## ACADEMIC ACCOMMODATIONS

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early as possible in the semester. DSP is located in STU 301,

and is open 8.30am-5.00pm, Monday through Friday. The phone number for DSP is (213) 740-0776.

## ACADEMIC DISHONESTY

I refer you to the University's guidelines on academic integrity for students. Be aware that the penalties for graduate students are generally stricter than those for undergraduate students. You are all subject to these guidelines, and in the event of any violation I would seek the strongest possible penalty.

## COURSE OUTLINE

### I. INTRODUCTION TO ECONOMIC GROWTH

Cooley, Chapter 1

Barro and Sala-i-Martin, Chapter 1

Chari, Kehoe and McGatten (2004) "The Poverty of Nations: A Quantitative Investigation", Federal Reserve Bank of Minneapolis Staff Paper #204/JV

### II DYNAMIC COMPETITIVE GENERAL EQUILIBRIUM

Lecture notes #1 by Dirk Krueger

Llungqvist and Sargent, Chapter 7

Negishi, T. (1960) "Welfare Economics and Existence of an Equilibrium for a Competitive Economy", Metroeconomica, 12, 92-97

Kehoe, T. (1989) "Inter-temporal General Equilibrium Models", in F. Hahn (ed.) *The Economics of Missing Markets* Clarendon Press

### III THE NEOCLASSICAL GROWTH MODEL AND DYNAMIC PROGRAMMING

Lecture notes #2 by Dirk Krueger (#3 optional)

Stokey and Lucas, Chapters 2-6,

Sargent, Chapter 1

Llungqvist and Sargent, Chapters 2-4, Chapter 11

R. M. Solow, Growth Theory: An Exposition. Oxford: Clarendon Press, (1970)

## IV ASSET PRICING AND CONSUMPTION

Sargent, Chapter 3

Stokey and Lucas, Chapter 10

Llungqvist and Sargent, Chapters 7 and 10

## V BUSINESS CYCLES AND EMPLOYMENT

Cooley, Chapters 1, 5, 6, and 8

Hodrick, R. and Edward C. Prescott (1997) "Post-War Business Cycles: A Descriptive Empirical Investigation", *Journal of Money, Credit and Banking,* 29, 1-16

Hansen, Gary D. and Randall Wright (1992) "The Labor Market in Real Business Cycle Theory", Federal Reserve Bank of Minneapolis Quarterly Review

Kydland and Prescott (1982) "Time to Build and Aggregate Fluctuations", *Econometrica,* 50, 1345-1370 (paper available on Ungor's website).

Lucas, R.E. (1987) *Models of Business Cycles* New York: Basil Blackwell

Hansen, Gary D. "Indivisible Labor and the Business Cycle", *Journal of Monetary Economics,* 16, 309-327

## VI THE OVERLAPPING GENERATIONS MODEL

Lecture notes #5 by Dirk Krueger

Sargent, Chapter 7

Llungqvist and Sargent, Chapter 8

Barro, R. (1974) "Are Government Bonds Net Wealth?" *Journal of Political Economy,* 82, 1095-1117

Diamond, P. (1965) "National Debt in a Neo-Classical Growth Model", A*merican Economic Review,* 55, 1126-1150

Gale, D. (1973) “Pure Exchange Equilibria of Dynamic Economic Models”, *Journal of Economic Theory,* 6, 12-36

Kehoe, T. (1989) “Inter-temporal General Equilibrium Models”, in F. Hahn (ed.) *The Economics of Missing Markets* Clarendon Press

## DISCUSSION SESSIONS

There will be two types of discussion session with the teaching assistant; a weekly theory/analytical session and also a MATLAB session. Here is a *proximate* outline of the sessions.

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**TA Session schedule:**

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|---|---|---|
| Session # 1 | Theory | Convex optimization Theory<br>• Convex sets and concave functions<br>• Theorems guarantying the existence of a solution<br>• Lagrange and KT theorems |
| | Matlab | Introduction to Matlab<br>• m-files, loops and basic commands.<br>• Defining functions in Matlab. |
| Session # 2 | Theory | Review of difference equations<br>• Concept of a solution to a difference equation.<br>• Types of difference equations.<br>• Concept of steady state. Study of eigenvalues.<br>• Computing impulse response functions. |
| | Matlab | Solving systems of simultaneous equations<br>• Solution to linear systems<br>• Solution to non-linear systems<br>• Computing steady states analytically and numerically |
| Session # 3 | Theory | The Solow growth model<br>Introduction to Optimal growth Theory<br>• The Social Planner formulation<br>• Pareto Optimality<br>• Welfare Theorems |
| | Matlab | Implementing the Solow growth model in Matlab |
| Session # 4 | Theory | Equilibrium Concepts (I): Arrow-Debreu markets |
| | Matlab | --- |
| Session # 5 | Theory | Equilibrium Concepts (II): Sequential markets |
| | Matlab | --- |
| Session # 6 | Theory | Review before Midterm exam |
| | Matlab | --- |

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| Session # 7 | Theory | Recursive formulation of stationary problems.<br>• Characterization and solution<br>• Inter and intra-temporal choices.<br>• Closed form example |
| | Matlab | Solving the neo-classical growth model in Matlab<br>Implementing value function iteration in Matlab |
| Session # 8 | Theory | Solving DSGEs (part I)<br>• Local solution methods |
| | Matlab | Solving rational expectation models in the computer<br>Implementing local approximation methods in Matlab<br>Uhlig toolkit |
| Session # 9 | Theory | Solving DSGEs (part II)<br>• Global solution methods<br>• Computing the model's steady state. |
| | Matlab | Solving Rational Competitive Equilibriums in Matlab<br>State variables and the curse of dimensionality. |
| Session # 10 | Theory | Solving DSGEs (part III)<br>• Multi-sector models<br>• Models with habit formation<br>• Time to build constraints |
| | Matlab | Higher order approximation toolkits<br>Solving DSGEs with Dynare<br>Simulating and studying model dynamics in Matlab |
| Session # 11 | Theory | RBC Models<br>• Model calibration<br>• Markov chains<br>• Time to build constraints and other real frictions |
| | Matlab | Filtering theory: HP and Kalman filters. |
| Session # 12 | Theory | Asset pricing practice problems |
| | Matlab | Asset pricing applications in Matlab |
| Session # 13 | Theory | OLG practice problems |
| | Matlab | The Parametrized Expectations approach |
| Session # 14 | Theory | Review before Final exam |
| | Matlab | --- |