Econ 7032:
Macroeconomics of Innovation

Syllabus – Fall 2015

General Information

Instructor: Dr. Juan Moreno-Cruz   Office phone: 404 385 1100

Assistant Professor School of Economics   Office room: 319 Old CE Building

Georgia Institute of Technology   E-mail: morenocruz@gatech.edu

                                                       Office hours: by appointment

                                                       Class Meetings: TR 12:05 - 13:25

Course Description: The process of economic growth is one of the most interesting, important, and challenging areas in economics. The purpose of this course is to introduce graduate students to these major questions and to the theoretical and empirical tools needed to answer them.

Course Main Goal: When we are done with this course you should be able to understand the role of innovation in determining why some countries grow and some other fail to do so. You should go beyond the mechanics of the models we learned and ask the right questions regarding the causes of economic growth.

Textbooks:
Required:

- (DA) Daron Acemoglu, Introduction to Modern Economic Growth, Princeton University Press 2009.
- (OG) Oded Galor, Unified Growth Theory, Princeton, 2011.

Supplementary texts:

- (AH) Philippe Aghion and Peter Howitt, The Economics of Growth, The MIT Press 2009.
- (BSM) Robert J. Barro and Xavier Sala-i-Martin, Economic Growth, Second Edition, MIT Press 2004.
- (DR) Romer, David (1996): Advanced Macroeconomics, second edition (2001), McGraw-Hill.
- (SL) Stokey, Nancy L. and Robert E. Lucas Jr. (1989): Recursive Methods in Economic Dynamics, Harvard University Press.

Course Requirements and Grading

Grade scale		Weights	
A's	Above 90%	Problem sets:	20%
B's	Between 80%-90%	Midterm:	30%
C's	Between 60%-80%	Final Exam:	40%
D's	Below 60%	Presentations:	10%

Note: Proportions for each letter grade may vary depending on the overall class performance, class participation, etc. Throughout semester, no student is allowed to ask a personal negotiation on grade; I will not reply to such email(s).

Exams:

1. Most of exam questions may be more or less similar to those in problem sets. However, some questions may be designed in a challenging manner to test your understanding on the materials. Detailed information will be provided in class at due time.
2. You cannot make any appeal on partial credits on the exams, though you can appeal on the obvious errors.
3. No makeup tests for midterm will be administered. If there are exceptional circumstances and you can't take the regularly scheduled test, you must notify me before the regularly scheduled test with a legitimate reason along with official documentation. With an acceptable excuse, the other two exams will be used to determine the course grade.

Presentations:

1. Each student will present one paper during the semester. I will give a list of papers to choose from. Students then will present the paper as if they were the authors.
2. The presentation will take 20 minutes (15 talk + 5 questions).
3. A summary of the paper should be prepared and distributed to the rest of the class before the presentation takes place.

Course Guidelines

Class Conduct

1. Please turn off cell phones, music players , etc. Please do not use headphones or earphones during the class. No Laptop in the classroom. No food (cookies, burger, sandwich, etc) in the classroom. (Non-alcoholic) Drinks are OK.
2. Be on time and do not leave earlier. If you must leave early, please let me know in advance. Chronic tardiness may result in course failure. If you miss class, please talk to your classmate who attended class regarding what we covered. If you miss class, I will not go over this material with you on an individual basis. Last minute emails will not be answered.
3. Any violation of Honor Code will be referred to the Dean of Students Office.

Course Calendar and Content

Part I: Dynamic Optimization and Examples

Midterm 1: Wednesday, October 1st

Part II: Endogenous growth theory

Part III: Unified growth theory

Final exam: as scheduled by Registrar

Exam dates are fixed; you must plan your travel accordingly in advance.

Tentative Course Schedule

Week (Class dates)	Topics we learn	Notes
Part I		
Week 1 (Aug 18-20)	Dynamic Programming	
Week 2 (Aug 25-27)	Dynamic Programming	PS 1. Due Sep 3
Week 3 (Sep 1-3)	Consumption	
Week 4 (Sep 8-10)	Optimal Control	PS 2. Due Sep 10
Week 5 (Sep 15-17)	Neoclassical Investment Theory	
Week 6 (Sep 22-24)	Neoclassical Growth Theory	PS 3. Due Sep 29
Week 7 (Sep 29- Oct 1)	Review and Midterm Exam	Midterm Exam
Part II		
Week 8 (Oct 6-8)	AK Model	
Week 9 (Oct. 15)	Expanding Variety Models	PS 4. Due Oct 22
Week 10 (Oct. 20-22)	Quality Competition Models	
Week 11 (Oct. 27-29)	Directed Technical Change Models	PS 4. Due Nov 5
Part III		
Week 12 (Nov 3-5)	Growth and Comparative Development	PS 5. Due Nov 12
Week 13 (Nov. 10-12)	The Malthusian Theory	
Week 14 (Nov. 17-19)	Unified Growth Theory	PS 6. Due Nov 24
Week 15 (Nov. 24)	Review	
Week 16 (Dec. 1-3)	Presentations	

Note: I will generally follow the above sequence. I may add or subtract topics.

Readings

I. Dynamic Optimization: Discrete Time

This part considers dynamic optimization problems in discrete time. We will model and solve typical dynamic economic problems using the tools of dynamic programming. We will use these tools to develop the permanent income hypothesis, the Ricardian equivalence and the Lucas critique, and to understand the role of adjustment costs in investment problems.

A. Theory: Discrete Dynamic Programming

- DA (Chapter 6)
- Sargent, Thomas J. (1987): Dynamic Macroeconomic Theory (chapter 1).
- SL (Chapters 3, 4 and 5).

B. Applications: 1. Consumption and Saving

- Romer (1996, chapter 7). Hall, Robert E. (1978): "Stochastic Implications of the Life Cycle Permanent Income Hypothesis: Theory and Evidence", Journal of Political Economy 86, 971–987.

2. Investment

- Romer (1996, chapter 8).

3. Lucas's Critique

- Lucas, Robert E. (1976): "Econometric Policy Evaluation: A Critique", Carnegie-Rochester Conference Series on Public Policy 1, 19–46.

II. Dynamic Optimization: Continuous Time

This part considers optimal control problems in continuous time. We will focus on the modeling and solving of typical dynamic economic problems using the maximum principle. In this context we will analyze the one-sector model of optimal growth and the Neoclassical theory of investment.

A. Theory: The Maximum Principle

- DA (Chapter 7)
- Arrow, Kenneth J. and Mordecai Kurz (1970): Public Investment, the Rate of Return, and Optimal Fiscal Policy, The Johns Hopkins Press (chapter 2).

B. Applications: Investment

- Hayashi, Fumio (1982): "Tobin's Marginal and Average q: A Neoclassical Interpretation", Econometrica 50, 213–224.

III. Dynamical Systems

This is an introduction to the analysis of difference and differential equations, including the solution of the simplest linear dynamic systems, the linearization of non-linear systems and the use of phase diagrams.

- Azariadis, Costas (1993): Intertemporal Macroeconomics, Blackwell (chapters 2, 4 and 6).
- Luenberger, David G. (1979): Dynamic Systems, John Wiley & Sons (chapters 2 and 9).

IV. Dynamic General Equilibrium Analysis

A. Introduction: Walrasian Models

We begin this part with an introduction to dynamic general equilibrium models. We will focus on equilibrium market clearing models without search frictions. The main objective is to understand the idea of general equilibrium in the context of the simplest economic models of a society.

- DA (Chapter 5)
- Bliss, Christopher (1975): Capital Theory and the Distribution of Income, (chapter 3).
- Mas-Colell, Andreu, Michael D. Whinston and Jerry R. Green (1995): Microeconomic Theory, Oxford University Press, (chapters 19 and 20).
- SL (Chapters 2 and 15).

B. The Ramsey Growth Model

The goal is to understand the structure of the Neoclassical growth model, which is the basic workhorse model in macroeconomics.

- DA (Chapters 8, 10)
- DR (1996, chapters 1 and 2).
- BSM (1995, chapters 1 and 2).

C. Overlapping Generations Models

We will model and analyze the problems of exchange and production in the simplest dynamic general equilibrium framework, that is, one with an overlapping generations demographic structure. We will focus on the notion of dynamic inefficiency. In this context we will consider the role of social security in capital accumulation.

- DA (Chapter 9)
- DR (1996, chapter 2).
- Shell, Karl (1971): "Notes on the Economics of Infinity", Journal of Political Economy 79, 1002–1011.
- Gale, David (1973): "Pure Exchange Equilibrium of Dynamic Economic Models", Journal of Economic Theory 5, 12–36.

- Diamond, Peter A. (1965): "National Debt in a Neoclassical Growth Model", American Economic Review 55, 1126–1150.
- Barro, Robert J. (1974): "Are Government Bonds Net Wealth?", Journal of Political Econ- omy 82, 1095–1117.
- Samuelson, Paul A. (1975): "Optimum Social Security in a Life-Cycle Growth Model", International Economic Review 16, 539– 544.

V Models of Endogenous Growth

We will develop the modern theory of economic growth. In turn we will look at (1) the AK model, (2) models of growth with externalities and perfect competition, (3) models of endogenous technological progress, and (4) models with multiple equilibria.

- DA (Chapters 11, 12, 13, 14 and 15)
- DR (1996, chapter 3).
- BSM (1995, chapters 4, 5, 6 and 7).
- Rebelo, Sergio (1991): "Long-Run Policy Analysis and Long-Run Growth", Journal of Political Economy 99, 500–521.
- Romer, Paul M. (1986): "Increasing Returns and Long-Run Growth", Journal of Political Economy 94, 1002–1037.
- Lucas, Robert E. (1988): "On the Mechanics of Economic Development", Journal of Mon- etary Economics 22, 3–42.
- Romer, Paul M. (1987): "Growth Based on Increasing Returns Due to Specialization", American Economic Review, Papers and Proceedings (May), 56–62.
- Romer, Paul M. (1990): "Endogenous Technological Change", Journal of Political Economy 98, 71–102.
- Grossman, Gene M. and Elhanan Helpman (1991): "Quality Ladders and Product Cycles", Quarterly Journal of Economics 106, 557–586.
- Aghion, Philippe and Peter Howitt (1992): "A Model of Growth Through Creative Destruction", Econometrica 60, 323–351.
- Murphy, Kevin J., Andrei Shleifer and Robert W. Vishny (1989): "Industrialization and the Big Push", Journal of Political Economy 97, 1003–1026.
- Galor, Oded and Joseph Zeira (1993): "Income Distribution and Macroeconomics", Review of Economic Studies 60, 35–52.

B. Growth Theory v. Growth Empirics v. Growth Policy

We will consider some of the evidence concerning cross-country differences in income per capita, and economic growth at the level of the world. The focus is on the importance of economic theory both for growth empirics and for practical growth policy.

- DA(Chapters 3 and 4)

- Mankiw, N. Gregory, David Romer and David N. Weil (1992): "A Contribution to the Empirics of Economic Growth", Quarterly Journal of Economics 107, 407–437.
- Hall, Robert and Charles I. Jones (1999): "Why Do Some Countries Produce So Much More Output Per Worker Than Others?", Quarterly Journal of Economics (February), 83–116.
- Chari, V.V., Patrick Kehoe and Ellen McGrattan (1997): "The Poverty of Nations: A Quantitative Investigation", Working Paper, Federal Reserve Bank of Minneapolis.
- Kremer, Michael (1993): "Population Growth and Technological Change: One Million B.C. to 1990", Quarterly Journal of Economics (August), 681–716.
- Jones, Charles I. (1995): "R&D Based Models of Economic Growth", Journal of Political Economy 103, 759–784.

V. Unified Growth Theory

Economic world history and future performance.

- OG (Chapters 1-6)
- Quamrul Ashraf and Oded Galor, "Dynamics and Stagnation in the Malthusian Epoch," American Economic Review, 101(5), 2003-2041, (August 2013)
- Galor Oded and David N. Weil, "From Malthusian Stagnation to Modern Growth," American Economic Review, 89, 150-154, (May 1999)
- Galor Oded and David N. Weil, "Population, Technology and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond," American Economic Review, 90, 806-828, (September 2000)
- Galor Oded and Omer Moav, "Natural Selection and the Origin of Economic Growth," Quarterly Journal of Economics, 117, 1133-1192 (November 2002)
- Gregory Clark, "Human Capital, Fertility and the Industrial Revolution" Journal of the European Economic Association, 3 (2-3) (2005): 505-515.
- Gregory Clark, "Urbanization, Mortality and Fertility in Malthusian England." (with Neil Cummins), American Economic Review, 99(2) (May 2009): 242-7.