ECONOMICS 117: ECONOMIC GROWTH

Winter 2004	**T,Th 2:00 – 3:20pm**	**CSB 001**
Prof.: Mark Machina	Economics Bldg. 217	Hours: Thurs.8-11,1-2
TA: Jason Murray	Economics Bldg. 127	Mon.12-1, Wed.2-3

The subject of this course is the modern theory of economic growth: the tradeoff between current and future consumption, the stability of capitalist economies, the effects of technological progress and monetary policy on economic growth, and the consequences of sustained, or alternatively, of zero economic growth. This course does *not* cover environmental economics – that is the focus of Econ 131: "Economics of the Environment."

Jan. 6	The Mathematics of Growth I
Jan. 8	The Mathematics of Growth II
Jan. 13	Consumption vs. Growth with a Fixed Population: Robinson Crusoe's Problem
Jan. 15	Consumption vs. Growth with a Growing Population: Blue Lagoon Problem
Jan. 20	Is Capitalism Doomed? The Harrod-Domar Growth Model I
Jan. 22	Is Capitalism Doomed? The Harrod-Domar Growth Model II
Jan. 27	**(Tuesday) 1st Midterm Exam, Mandeville Auditorium**
Jan. 29	The Stabilizing Effect of Substitutability: The Neoclassical Growth Model I
Feb. 3	The Stabilizing Effect of Substitutability: The Neoclassical Growth Model II
Feb. 5	Extensions of the Neoclassical Growth Model I
Feb. 10	Extensions of the Neoclassical Growth Model II
Feb. 12	Technological Progress and Economic Growth I
Feb. 17	Technological Progress and Economic Growth II
Feb. 19	Optimal Growth: The "Golden Rule"
Feb. 24	**(Tuesday) 2nd Midterm Exam, Mandeville Auditorium**
Feb. 26	Money and Economic Growth
Mar. 2	Human Capital and Endogenous Economic Growth
Mar. 4	Measuring the Rates and Determinants of Economic Growth
Mar. 9	Alternative Theories of Growth and Distribution
Mar. 11	Growth in a Finite World: The "Limits to Growth" Debate
Mar. 22	**(Friday) FINAL EXAM 11:30am – 2:30pm (location to be announced)**
	(Review Sessions will be scheduled prior to each exam.)

READINGS: A list of required and optional readings is attached. The required readings are available from Soft Reserve. Additional handouts will be passed out in class.

LECTURES AND SECTIONS: You are responsible for all the material in the lectures. If you miss one, borrow someone's notes.

GRADING: Your grade will be determined on the basis of two Midterm Exams and a Final.

PRACTICE QUESTIONS: The Soft Reserve Package also contains a set of all of my old Econ

117 exam questions. Although we will go over some of these questions in office hours and review sessions, the best way to prepare for the exam is to practice doing them yourself.

ECONOMICS 117: COURSE OUTLINE

I. THE MATHEMATICS OF GROWTH

- **a. Production Functions (Quick Review)**
- **b. Elasticity (Quick Review)**
- **c. Discrete Time versus Continuous Time**
- **d. Growth of Discrete Time Variables**
  - Proportional Growth Rate over a Given Period
  - Constant Proportional Growth and Compounding
- **e. Growth of Continous Time Variables**
  - Instantaneous Proportional Growth Rate at a Given Moment
  - Constant Proportional Growth (i.e. Exponential Growth)
- **f. Products and Ratios of Growing Variables**
- **g. Functions of Growing Variables**
- **h. Notion of a "Steady State"**

II. CONSUMPTION VS. GROWTH WITH A FIXED POPULATION: ROBINSON CRUSOE'S PROBLEM

- **a. The Tradeoff Between Current and Long Run Consumption Levels**
- **b. Maximizing Steady State Consumption**

III. CONSUMPTION VS. GROWTH WITH A GROWING POPULATION: THE BLUE LAGOON PROBLEM

- **a. The Effect of Population Growth on the Robinson Crusoe Problem**
- **b. Maximizing Steady State Per Capita Consumption**

IV. IS CAPITALISM DOOMED? THE HARROD-DOMAR MODEL

- **a. The Leontief or "Fixed Proportions" Production Function**
- **b. The "Natural" Rate of Growth**
- **c. The "Warranted" Rate of Growth**
- **d. The Instability of the Economy**

V. STABILIZING EFFECT OF SUBSTITUTABILITY: THE NEOCLASSICAL MODEL

- **a. Constant Returns to Scale (CRS) Production Functions**
  - Definition of Constant Returns to Scale (and Scale Invariance)
  - Examples: Linear, Leontief, Cobb-Douglas, CES
  - Some Strange & Wonderful Properties of CRS Production Functions
    - Marginal and Average Products are All Scale Invariant
    - Euler's Theorem
    - Input Elasticities Sum to Unity
- **b. Factor Substitutability and "Smooth" Production Functions**
- **c. The Automatic Stabilizing Effect of Factor Substitution**

d. Comparative Statics of the Steady State
e. The Long Run Distribution of Income

VI. EXTENSIONS OF THE NEOCLASSICAL GROWTH MODEL
a. Variable Population Growth Rates
b. Variable Labor Supply
c. Variable Savings Rate
d. Taxation

VII. TECHNOLOGICAL PROGRESS AND ECONOMIC GROWTH
a. The Sources of Technical Progress
b. The Three Implications of Technical Progress
c. Hicks Neutral, Harrod Neutral & Solow Neutral Technical Progress
d. Continuous Technical Progress
e Technical Progress and Economic Growth
f. Embodied Technical Progress

VIII. OPTIMAL GROWTH: THE "GOLDEN RULE"
a. Diagrammatic Representation of the Golden Rule
b. Intuitive Explanation of the Golden Rule

IX. MONEY AND ECONOMIC GROWTH
a. Money as an Asset
b. The Neoclassical Growth Model with Money
c. The Effects of Monetary Policy on Economic Growth

X. HUMAN CAPITAL AND ENDOGENOUS ECONOMIC GROWTH

XI. MEASURING THE RATES AND DETERMINANTS OF ECONOMIC GROWTH
a. Estimating "Aggregate Production Functions"
b. Estimating Technological Progress and the Effects of Education
c. Data Sets and Growth Accounting
d. Empirical Analysis of Regional and Cross-Sectional Data Sets

XII. ALTERNATIVE THEORIES OF GROWTH & THE DISTRIBUTION OF INCOME
a. The Ricardian and Marxian Theories
b. The Keynesian or "Cambridge" Theory

XIII. GROWTH IN A FINITE WORLD: THE "LIMITS TO GROWTH" DEBATE
a. The Possibility of Sustained Economic Growth
b. The Desirability of Sustained Economic Growth

c. The Consequences of Zero Economic Growth

d. Global Modeling: The Club of Rome Model

ECON 117 READINGS

(Starred readings are required)

GENERAL TEXTS AND SURVEYS (in increasing order of difficulty)

Baumol, W.J., *Economic Dynamics: An Introduction,* New York: The Macmillan Company, 1970. Chs. 1-4, 17.

Solow, R.M., *Growth Theory: An Exposition,* Oxford: Oxford University Press, 1970

Hamburg, D., *Models of Economic Growth,* New York: Harper & Row, 1971.

Ramanathan, R. *Introduction to the Theory of Economic Growth,* Berlin: Springer-Verlag, 1982

Neher, P.A., *Economic Growth and Development: A Mathematical Introduction,* New York: John Wiley & Sons, 1971.

Hahn, F., and R. Matthews, "The Theory of Economic Growth: A Survey," *Economic Journal* 74 (1964), 779-902.

Dixit, A., *The Theory of Equilibrium Growth,* Oxford: Oxford University Press, 1976.

Burmeister, E., and Dobell, A.R., *Mathematical Theories of Economic Growth,* New York: The Macmillan Company, 1970.

Barro, R. and X. Sala-I-Martin, *Economic Growth,* McGraw-Hill, 1995

BOOKS OF READINGS

Sen, A. (Ed.), *Growth Economics: Selected Readings,* New York: Penguin Books, 1970.

Stiglitz, J. and H. Uzawa (Eds.), *Readings in the Modern Theory of Economic Growth,* Cambridge, Mass.: MIT Press, 1969.

READINGS BY TOPIC

I: Appropriate sections of Econ 117 Math Handout

II/III: The lectures on this material will be self-contained

IV: * Domar, E., "Expansion and Employment," *American Economic Review* 37 (1947), 34-55.

Harrod, R., "An Essay in Dynamic Theory," *Economic Journal* 49 (1939), 14-33. Reprinted in Sen (1970) and in Stiglitz & Uzawa (1969).

V: * Solow, R., "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics* 70 (1956), 65-94. Reprinted in Sen (1970) and in Stiglitz & Uzawa (1969).

VI: * Solow, R., "A Contribution ... "

VII: * Nicholson, W., *Microeconomic Theory* 5th Edition, Hinsdale, Ill.: Dryden Press, 1992. Pages 316-320.

Solow, R., "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics* 39 (1957), 312-320.

Conlisk, J. "A Modified Neoclassical Growth Model with Endogenous Technical Change," *Southern Economic Journal* 34 (1967), 199-208.

VIII: * Phelps, E.S., "The Golden Rule of Accumulation: A Fable for Growthmen," *American Economic Review* 51 (1961), 638-643. Reprinted in Sen (1970).

Marty, A., "The Neoclassical Theorem," *American Economic Review* 54 (1964), 1026-29.

IX: * Johnson, H., "Money in a Neo-Classical One-Sector Growth Model," in H. Johnson, *Selected Essays in Monetary Economics,* London: George Allen & Unwin, 1978. Reprinted in Sen (1970).

Tobin, J., "The Neutrality of Money in Growth Models: A Comment," *Economica* 34 (1967), 69-72.

Johnson, H., "The Neutrality of Money in Growth Models: A Reply," *Economica* 34 (1967), 73-74.

X: * Romer, P. "Increasing Returns and Long-Run Growth," *Journal of Political Economy* 94 (1986), 1002-1037.

XI: * Reich, R., "The Quiet Path to Technological Preeminence," *Scientific American* 261 (1989), 41-47.

Mankiw G., D. Romer, and D. Weil. "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics* 107 (1992), 407-437.

Kuznets, S., *Economic Growth of Nations: Total Output and Production Structure,* Cambridge, Mass.: Belknap Press, 1971.

Dennison, E., *Why Growth Rates Differ: Postwar Experience in Nine Countries,* Washington, D.C.: Brookings Institution, 1967.

Summers, R. and A. Heston. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988," *Quarterly Journal of Economics* 106 (1991), 327-368.

XII: * Kaldor, N., "Alternative Theories of Distribution," *Review of Economic Studies* 23 (1955-56), 83-100. Reprinted in Sen (1970) and in Stiglitz & Uzawa (1969).

XIII: Forrester, J., *World Dynamics,* 2nd Ed., Cambridge, Mass.: Wright-Allen, 1973.

Meadows, D., D. Meadows, J. Randers, and W. Behrens, *Limits to Growth,* New York: Universe Books, 1972.

Mishan, E., *Costs of Economic Growth,* London: Staples Press, 1967.

Weintraub, A., E. Schwartz, and J. Aronson (Eds.), *The Economic Growth Controversy,* White Plains, New York: Inter. Arts & Sciences Press, 1973.