

ECO 499: Mathematical Economics - Independent Study - Spring 2016

Instructor Information:

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Course Description:

The course builds upon first year college calculus to build a mathematical foundation for students interested in pursuing doctorate degrees in economics or students interested in better understanding current scholarly literature that uses theoretical microeconomics and macroeconomics. The course topics include static partial and general equilibrium analysis, comparative statics, unconstrained and constrained optimization over multiple variables and their second order conditions, and dynamic equilibrium analysis with discrete time. While achieving these goals, we will develop familiarity with mathematical tools including matrix algebra, partial differentiation, total differentiation, differentiating implicit functions, calculus of exponential and logarithmic functions, and Taylor series. Prerequisite: ECO 308: Intermediate Microeconomics and MTH 207: Calculus I

Learning Outcomes:

1. Solve multivariate static and general equilibrium models and comment on the economic meaning of the variables, parameters, and solution.
2. Conduct comparative static analysis to explicit-function and general-function models and interpret the economic meaning of the results.
3. Use calculus and matrix algebra tools to optimize unconstrained and constrained (equality-constrained) mathematical models and compute and interpret the meaning of the second-order conditions.
4. Solve multivariate first-order difference equation equilibrium models and establish dynamic stability of the equilibrium.

Economics Major Learning Outcomes:

This course contributes the learning outcomes of the economics major listed below, and in particular the outcomes related to developing problem solving skills.

1. Critical Thinking Skills:
 - a) Apply economic reasoning to explain social and economic events.
 - b) Predict the impact of private and public proposals and changing market conditions on social welfare using economic models.
 - c) Compare the models' strengths and weaknesses in explaining outcomes.
2. Problem Solving Skills:
 - a) Identify and analyze a problem within the framework of economic models.
 - b) Evaluate, critique, and formulate solutions to an identified problem.
3. Communication Skills:
 - a) Communicate effectively the results of economic research and analysis to colleagues and decision-makers through written reports and oral presentations.

Course work:

Complete the problems below out of Alpha Chiang's *Fundamental Methods of Mathematical Economics, 3/E*. Students will meet once per week with the instructor to evaluate completed problems and it is expected that students will meet once per week with each other to discuss the assigned problems.

Chapter 2: Economic models

Problems: 2.3 (17) 2, 3, 8 2.4 (23) 1, 4, 5, 6 2.5 (29) 3, 5, 6

Chapter 3: Equilibrium analysis

Problems: 3.2 (40) 1, 2 3.3 (45) 1, 2, 5, 6 3.4 (51) 3 3.5 (53) 1, 3

Chapter 4: Linear models and matrix algebra

Problems: 4.1 (58) 1, 2 4.2 (66) 2, 4, 5, 6 4.3 (74) 1, 3, 7 4.4 (78) 4, 5, 6
4.5 (81) 1, 2, 6 4.6 (87) 1, 2, 6

Chapter 5: More linear models and matrix algebra

Problems: 5.1 (92) 1, 2, 3 5.2 (98) 1, 3, 4 5.3 (103) 3, 4, 5, 7 5.4 (107) 2, 4
5.5 (112) 1, 2, 3 5.6 (115) 1, 2

Chapter 6: Comparative statics and the derivative

Problems: 6.2 (131) 1, 2, 3 6.4 (140) 1, 2, 3 6.5 (144) 1, 2, 3 6.6 (147) 1, 3
6.7 (153) 2, 3, 4

Chapter 7: Rules of differentiation and their use in comparative statics

Problems: 7.1 (159) 1, 2, 3 7.2 (169) 1, 2, 4, 5 7.3 (173) 1, 3, 5
7.4 (177) 1, 4, 5 7.5 (184) 1, 2 7.6 (186) 1

Chapter 8: Comparative-static analysis of general-function models

Problems: 8.1 (193) 2, 3, 4 8.2 (195) 1, 3, 5 8.3 (198) 1, 3
8.4 (203) 1, 2, 3 8.5 (214) 1, 7 8.6 (225) 1, 2, 3, 4, 5, 6

Chapter 9: Optimization: A special variety of equilibrium analysis

Problems: 9.2 (239) 1, 2, 3 9.3 (244) 1, 2, 3 9.4 (253) 3, 4, 5, 6
9.5 (262) 2, 3 9.6 (267) 1

Chapter 10: Exponential and logarithmic functions

Problems: 10.1 (273) 1, 3 10.2 (281) 3, 4, 5 10.3 (287) 1, 2, 3 10.4 (291) 3, 4, 6
10.5 (297) 1, 3, 6 10.6 (301) 1, 2 10.7 (305) 1, 2, 9

Chapter 11: The case of more than one choice variable

Problems: 11.2 (318) 1, 3, 5 11.3 (331) 1, 2, 3, 6, 7 11.4 (337) 1, 3, 7
11.5 (352) 1, 2, 6, 7 11.6 (363) 1, 2, 3, 4 11.7 (368) 1

Chapter 12: Optimization with equality constraints

Problems: 12.2 (378) 1, 2, 4 12.3 (386) 1, 2 12.4 (399) 2, 4, 7
12.5 (409) 1, 2, 3, 5 12.6 (417) 1, 4, 6, 7 12.7 (430) 1, 2, 6

Chapter 16: Discrete time: first-order difference equations

Problems: 16.2 (557) 1, 2, 3 16.3 (561) 1, 2, 3 16.4 (565) 1, 2, 3, 4
16.5 (569) 1, 2, 3 16.6 (575) 2, 3, 4