

UNIVERSITY OF WATERLOO

Department of Economics
Economics 311: Mathematical Economics

Course Outline (Fall 2014)

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Lecture Time: M-W, 4:00 to 5:20

Lecture Location: MC 2054

Office Hours: W, 10:00 to 11:30, or by appointment

Course description

Economics 311 is the second course in a two course sequence representing the core of mathematical economics required for undergraduate students in economics. The objective of this course is to prepare the students for most 400 level economics courses.

Topics include multivariate calculus, constrained and unconstrained optimization of n -variables, comparative statics and the Envelope Theorem, integration, and techniques for solving first order linear and non-linear difference and differential equations – all developed within the context of economic theory.

Textbook

The students are expected to read the chapters mentioned in the Topics section below. Ideally, the readings should be done before attending the lectures.

- Hoy, M., Livernois, J., McKenna, C., Rees, R., and Stengos, T., *Mathematics for Economists*, Third Edition, The MIT Press 2011 (**previous editions can also be used**)

Topics

For each topic, some problems are suggested. It is strongly recommended to try them before looking at the solution. They are good examples of the kind of questions you will find in the exams. The topics below do not include a review section. However, when needed, some concepts covered in Econ 211 can be briefly discussed.

1. Calculus for functions of n-variables (Chapter 11)
Analysis of functions through differentiation.
 - ◇ **Problems:** 1, 3, 5, 7, 9 (pages 471 and 472)
2. Unconstrained optimization (Chapter 12)
Maximization and minimization of functions of n variables.
 - ◇ **Problems:** 1 and 3 (pages 482-483), 1, 3, 5 (page 491), and 1 to 5 (pages 500 to 501)
3. Constrained optimization (Chapter 13)
Maximization and minimization of functions of n variables subject to linear or nonlinear constraints using the technique of the Lagrangian.
 - ◇ **Problems:** 1, 3, 5, 7 (pages 516 and 517), 1, 3, 5 (pages 525 to 526), and 1, 3 (pages 526 to 527)
4. Optimization with inequality constraints (Chapter 15))
Introduction to the Kuhn-Tucker conditions.
 - ◇ **Problems:** 1, 3, 5, 6 (pages 580 and 581)
5. Comparative statics and the Envelope Theorem (Chapter 14)
Analyzing the impact of changing the value of a coefficient on the solution of an optimization problem.
 - ◇ **Problems:** 1, 3, 5, 7 (pages 538 and 539), 1, 3, 5 (pages 561 and 562), and 1, 2, 3, 5 (pages 563 to 565)
6. Integration (Chapter 16)
Introduction to different techniques of integration.
 - ◇ **Problems:** 1, 3, 5, 7 (pages 591 to 593), 1, 3, 5, 6 (pages 604 and 605) 1 to 4 (page 613), 1, 3, 5 (page 622) 1, 3 (page 628), and 1, 3, 7, 9 (pages 630 and 631)

7. Linear and non linear difference equations (Chapters 17 to 20)

Solving dynamic problems in discrete time

- ◇ **Problems (Chapter 17):** 1, 3, 5, 7, 9, 11, 15 (page 642)
- ◇ **Problems (Chapter 18):** 1, 4, 7 (pages 655 and 656), and 1, 5, 7 (pages 662 to 664)
- ◇ **Problems (Chapter 19):** 1, 2, 3 (page 672), 1, 2, 3, 4 (pages 677 and 678), and 1, 3, 5, 7 (pages 679 and 680)
- ◇ **Problems (Chapter 20):** 1, 4, 5 (pages 706 and 707), and 1, 3, 5, 11, 13, 14 (pages 712 and 713)

8. Linear and non linear differential equations (Chapters 21 to 23)

Solving dynamic problems in continuous time

- ◇ **Problems (Chapter 21):** 1, 3, 5, 7 (pages 729 and 730), 1, 3, 5, 7 (page 736), and 1, 3, 5, 7 (pages 737 and 738)
- ◇ **Problems (Chapter 22):** 1, 3, 5 (page 747), and 1, 3, 5 6 (pages 750 and 751)
- ◇ **Problems (Chapter 23):** 1, 3 (pages 771 and 772), 1, 3, 5 (page 777), and 1, 3, 4, 5 (pages 778 to 780)

Evaluation

Homework (four assignments): 20%

Midterm (October 15th in class): 30%

Final exam (cumulative, date TBA): 50%

Policies on exams and assignments

Assignments must be handed in before the date and time written on the question sheet. There is no valid justification for not being on time. You will always have between 10 to 14 days to finish it. You must therefore organize your time to avoid being late. Late submission will result in a grade of 0, because the solution becomes available on LEARN right after the due date. If you have some serious personal issues that prevent you from doing it, do not wait until the due date to inform the instructor. Do it as soon as possible so that we can find a solution.

There will be no transfer of weights between the midterm and the final for any reason even if you do much better on the final. This type of policy penalizes students who work hard throughout the semester. You should therefore take every evaluation seriously and make sure that you are prepared.

If you miss the midterm, you must contact the instructor as soon as possible and send him documents that justify your absence. Only serious personal problems are considered valid reasons for missing an exam. If the justification is valid, the weight of the midterm is transferred to the final. There is no deferred midterm exam.

If you miss the final exam, you must follow the department policy in order to receive the right to write a deferred exam. For the detailed procedure, go to:
<http://economics.uwaterloo.ca/policies-and-resources>

Avoidance of Academic Offenses

All students registered in the courses of the Faculty of Arts are expected to know what constitutes an academic offense, to avoid committing academic offenses, and to take responsibility for their academic actions. When the commission of an offense is established, disciplinary penalties will be imposed in accord with Policy #71, Student Academic Discipline. For information on categories of offenses and types of penalties, students are directed to consult the summary of Policy #71, Student Academic Discipline <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>

If you need help in learning how to avoid offenses such as plagiarism, cheating, and double submission, or if you need clarification of aspects of the discipline policy, ask your course instructor for guidance. Other resources regarding the discipline policy are the graduate advisor and the Associate Dean of Graduate Affairs. Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy #70, Student Grievance <http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>