DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Economics
Advanced Mathematics for Economists, ECON 4700
Winter Term 2018

Instructor: John Rumsey, John.Rumsey@Dal.ca A13 6206 University Ave
Office Hours: Wednesday 10:30 - 11:30
Lectures: Tuesday & Friday 11:30 - 1:00

Course Description

The course emphasizes abstract analytical methods via a selection of topics in mathematics which prepares the advanced undergraduate student for pursuing graduate studies in economics. Topics include elements of mathematical logic, sets and correspondence, vector spaces, metric spaces, topological concepts, fundamentals of analysis, multivariate calculus, fixed point theorems, dynamic optimization.

Course Prerequisites

ECON 3700.03 with minimum grade of C

Course Objectives / Learning Outcomes

A student who is successful in this course should be able to:

- Construct a formal proof of a proposition, using one of four traditional types of proofs.
- Define and compute a norm of an element of a vector space and assess the convergence of a sequence of elements of a vector space.
- Use inverse images of sets to assess the continuity of functions.
- Compute a directional derivative and a Taylor series approximation for $f : \mathbb{R}^n \to \mathbb{R}^m$.
- Assess the stability of linear dynamical systems in $\mathbb{R}^n$.
- Solve a dynamic optimisation problem in discrete time and in continuous time.

Course Materials

Lecture notes for this course will be on the ECON4700 BrightSpace site for the course. Much material from ECON3700 will be assumed for this course. The text *Mathematics for Economists* by C.P. Simon & L. Blume, Norton, 1994, (SB) is a good reference for much of the course.

Course Assessment

Component	Weight	Date
Assignments	20%	
Midterm Test	35%	14 Feb 2018
Final Exam	45%	

There will be five assignments sets. Each problem set will have the same weight, 4% of the total 20%. The assignments will be due approximately every two weeks. The Midterm Test will be held during regular class time. The date of the final exam will be set by the registrar and will take place during the regular April examination period.

Assignments must be done individually and handed in before or on the due date. Only hard copy is acceptable.

DALHOUSIE UNIVERSITY

Conversion of numerical grades to Final Letter Grades

$(89.5, 100] \to \mathsf{A}^+$	$(84.5, 89.5] \to \mathsf{A}$	$(79.5, 84.5] \to \mathsf{A}^-$	$(76.5, 79.5] \to \mathsf{B}^+$
$(72.5, 76.5] \to \mathsf{B}$	$(69.5, 72.5] \to \mathsf{B}^-$	$(64.5, 69.5] \to \mathsf{C}^+$	$(59.5, 64.5] \to \mathsf{C}$
$(54.5, 59.5] \to \mathsf{C}^-$	$(49.5, 54.5] \to \mathsf{D}$	$[0, 49.5] \to \mathsf{F}$	

Course Policies

Late assignments will not be accepted. Missed assignments will be given a score of zero. There are no make-up tests for missed tests. If a class is cancelled (due to weather, for example) on the day when the in-class test is scheduled, the test will be rescheduled. If a class is cancelled on a non-test day, the decision to make up the class will depend on circumstances. Senate has approved a new policy for missed or late academic requirements due to student absence, which comes into effect Jan 1, 2018 (winter term). The link to the policy is:
http://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Approximate Schedule / List of Topics

Week	*Topic*	*References*
1, 2, 3	Set theory - logic - proofs - relations, functions - complex numbers	Notes §1,2; SB A1, A3
4, 5, 6	Metric and normed spaces: sequences - limits - convergence - vector spaces - open, closed, compact,convex sets & continuity - Cauchy-Schwartz inequality	Notes §3; SB Ch. 12, 29
7, 8, 9	Multivariate differential calculus - Directional Derivative - Taylor Series - Optimisation - Envelope Theorem	Notes §4; SB Ch. 13, 14, 30
10, 11	Differential and difference equations - Dynamical Systems and stability	Notes §5; SB Ch. 23-25
12, 13	Introduction to dynamic optimisation - Hamiltonian	Notes §6

"SB" refers the the text by Simon & Blume