

## Economics 389 (L01) (Introduction to Mathematical Economics II)

Instructor:	L. Vojtassak	Lecture Location:	PF 114
Phone:	220 6550	Lecture Days/Time:	MWF 12:00 – 12:50
Email:	<a href="mailto:lvojtass@ucalgary.ca">lvojtass@ucalgary.ca</a>		
Office:	SS336		
Office Hours:	MF 15:00 – 15:50 zoom or in-person R 9:00 – 9:50 zoom only <a href="https://ucalgary.zoom.us/my/luciavojtassak">https://ucalgary.zoom.us/my/luciavojtassak</a>		Winter 2022

### Course Description:

This is a continuation of Mathematical Economics I, where we discussed the essential mathematical background for studying Economics: economic models and equilibrium analysis, basic techniques of calculus including application in comparative statics, unconstrained and constrained optimization, and their applications to resource allocation problems. This course focuses on (i) tools of linear algebra to address topics introduced in Econ 387 again in  $n$ -dimensional space and (ii) mathematical techniques used in macroeconomic growth and dynamic models.

### Course Learning Outcomes:

This course introduces students to the application of mathematical methods in economic theory. It builds on topics introduced and partially analyzed in Econ 387.

By the end of the course students are supposed to be able to use economics models

1. to perform static equilibrium analysis and comparative statics analysis in  $n$ -dimensional linear models using tools of linear algebra (this involves review of matrices, matrix operations, determinants and their rules, Cramer's rule, Jacobian determinant, implicit differentiation for multiple equations, comparative statics of general function models);
2. to perform multi-variable optimization, and introduce concepts of convexity and concavity;
3. to perform constrained optimization, and introduce concepts of quasiconvexity and quasiconcavity;
4. to use concept of integrals, and use of integration;
5. to perform dynamic analysis on economic problems described by the first – order differential equations, both linear and nonlinear; with applications in economic growth models, and natural resource models;
6. to perform dynamic analysis on economic problems that involve higher order differential equations;
7. to perform dynamic analysis on economic problems with simultaneous differential equations.

**Course Outline:**

<u>Part I</u>	<u>Hours</u>
<b>Introduction to Mathematical Economics and Review</b>	1
<b>LECTURES 1-2: Linear Models and Matrix Algebra</b>	4
Review of Matrices, Matrix Operations, Multiplications, Transpose, determinants and Their Rules, Expansion by Cofactors, etc.	
<b>LECTURE 3: Extensions</b>	2
Jacobian determinants, Implicit Differentiation for Multiple Equations, Comparative Statics of General Function Models	
 <b><u>Part II</u></b>	
<b>LECTURE 4: Multivariable Optimization</b>	3
Definiteness, Objective Functions with more than Two variables	
<b>LECTURE 5: Optimization with Equality Constraints</b>	5
Extension to Econ 387, $n$ -variable and Multiconstraint cases, Second-order Conditions, Quasiconcavity and Quasiconvexity, Applications	
 <b><u>Part III</u> Dynamic Analysis</b>	
<b>LECTURE 6: Integral Calculus</b>	3
<b>LECTURE 7: First-order Differential Equations</b>	5
<b>LECTURE 8: Nonlinear Differential Equations</b>	2
<b>LECTURE 9: Higher-order Differential Equations</b>	4
<b>LECTURE 10: Simultaneous Differential Equations (if time permits)</b>	3

**Prerequisites/corequisites:**

Economics 387, Mathematics 211.

**Required Textbook(s):**

Chiang, Alpha C., and Kevin Wainwright 2005. *Fundamental Methods of Mathematical Economics*, 4<sup>th</sup> edition. McGraw-Hill.

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Chiang, A., and K. Wainwright (2005). *Fundamental Methods of Mathematical Economics*. 4<sup>th</sup> Edition. McGraw-Hill.

Hands D.W. (2004). *Introductory Mathematical Economics*. Oxford Press.

Hess, P. N. (2001). *Using Mathematics in Economic Analysis*. Oxford Press.

Hoy et al (2011). *Mathematics for Economics*. MIT.

Sydsaeter et al (2012). *Essential Mathematics for Economic Analysis*. 4<sup>th</sup> Edition. Pearson.

**Desire2Learn:**

This course will make use of the Desire2Learn (D2L) platform. Students who are registered in the course can log on at <http://d2l.ucalgary.ca> through their student centre. Please note that D2L features a class e-mail list that may be used to distribute course-related information. These e-mails go to your University of Calgary e-mail addresses only.

**Tutorials:**

Students are expected to attend the weekly tutorial section to which they have been assigned. During the tutorials, the TA will discuss pre-assigned questions and additional material relevant to the course that is not covered in lectures. Tutorials are on Wednesdays, 15:00 – 15:50.

**Grade Determination and Final Examination Details:**

4 assignments	5% each	<b>20%</b>	Due dates: Jan 26, Feb 16, March 18, and April 8, 2022.
3 Tests	15% each	<b>45%</b>	Dates: January 28, February 18, March 21, 2022
Final Examination		<b>35%</b>	
		<b>100%</b>	

The official grading system will be used. See <http://www.ucalgary.ca/pubs/calendar/current/f-1-1.html>.

A passing grade on minimum of 50% of the course work is required for a student to pass the course as a whole.

If a student's letter grade on the final exam exceeds their midterm(s) letter grade, the weight of the midterm(s) may be transferred to the final exam at the discretion of the instructor. The student must have written the midterm(s) or provided supporting documentation for the absence(s) such as a medical note or statutory declaration.

As per the Writing Across the Curriculum Statement in the Calendar, writing and grading thereof will be a factor in the evaluation of student work. See <https://www.ucalgary.ca/pubs/calendar/current/e-2.html>.

Course material dealing with a particular assignment will typically be covered in class at least 5 days before the assignment is due; thus, assignments can be completed at any time up to and including the due date. Given these factors, only situations where someone can document illness or domestic affliction for an extended period (i.e., the entire 5 days prior to the due date) would possibly warrant shifting the assignment weight to the final exam. Furthermore, technical problems can be expected to occur with computer systems (and internet availability) so it may be a good idea to not wait until the last minute to submit your assignment.

Any student work which remains undistributed after the last day of classes will be available to students through the instructor's office during the instructor's office hours.

The final examination will be comprehensive, scheduled by the Registrar, held in a classroom, and last 2 hours. If a student cannot write their final exam on the date assigned by the Registrar's Office, they need to apply for a deferred exam <https://www.ucalgary.ca/pubs/calendar/current/g-6.html>. Under no circumstance will this be accommodated by the Department.

Tests and exams **WILL NOT** involve multiple choice questions.

Programmable calculators, cellphones, textbooks, course notes, and other electronic devices will not be allowed during the writing of tests or final examinations. Students are reminded that simply being able to access their cellphone during an exam is academic misconduct.

THERE WILL BE NO MAKEUP OR DEFERRED QUIZZES/TESTS/EXAMS under any circumstances, nor may the quizzes/tests/exams be written early. Students unable to write the quizzes/tests/exams because of documented illness, family emergency, religious observance, or university-sanctioned event will have the weight shifted to the final examination; otherwise a grade of zero will be assigned.

**Test 1 and Test 2 on January 28 and February 18, 2022, will be online:**

This timed assessment will be available on D2L at the beginning of class on January 28 and February 18, at 12pm and will be available for 24 hours. When you access the assessment, you will have the length of the class, that is 50 minutes, to complete test and additional 25 minutes to scan, convert to pdf and submit it. If you experience an issue that affects your ability to complete the assessment, which can include (but is not limited to) issues with technology, caregiving responsibilities, or distractions within your test-taking environment, you will need to contact your instructor as soon as possible to arrange an alternate or (in the case of technical issues) extended time to write the assessment.

**Reappraisal of Grades:**

*For Reappraisal of Graded Term Work, see Calendar I.2*

<http://www.ucalgary.ca/pubs/calendar/current/i-2.html>

*For Reappraisal of Final Grade, see Calendar I.3*

<http://www.ucalgary.ca/pubs/calendar/current/i-3.html>

**Academic Misconduct:**

Academic Misconduct refers to student behavior that compromises proper assessment of students' academic activities and includes: cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

Student committing academic misconduct during the final exam will not receive a passing grade for the course.

For information on the Student Academic Misconduct Policy, Procedure and Academic Integrity, please visit: <https://www.ucalgary.ca/pubs/calendar/current/k-3.html>

**Academic Accommodations:**

Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services. SAS will process the request and issue letters of accommodation to instructors. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their instructor. The full policy on Student Accommodations is available at

<https://www.ucalgary.ca/legal-services/university-policies-procedures/accommodation-students-disabilities-procedure>

**Freedom of Information and Protection of Privacy (FOIP) Act:**

Personal information is collected in accordance with FOIP. Assignments can only be returned to the student and will be accessible only to authorized faculty and staff. For more information, see <https://www.ucalgary.ca/legal-services/access-information-privacy>

**Copyright Legislation:**

See the University of Calgary policy on Acceptable Use of Material Protected by Copyright at <https://www.ucalgary.ca/legal-services/university-policies-procedures/acceptable-use-material-protected-copyright-policy> Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

**Recording of Lectures:**

Recording of lectures is prohibited, except for audio recordings authorized as an accommodation by SAS or an audio recording for individual private study and only with the written permission of the instructor. Any unauthorized electronic or mechanical recording of lectures, their transcription, copying, or distribution, constitutes academic misconduct. See <https://www.ucalgary.ca/pubs/calendar/current/e-6.html>.

**Important Dates:**

Please check: <http://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html>.

**Student Organizations:**

Faculty of Arts Students' Association (F.A.S.A.):  
Economics Department Representative  
E-mail: [econrep@fasaucalgary.ca](mailto:econrep@fasaucalgary.ca)  
Website: [www.fasaucalgary.ca](http://www.fasaucalgary.ca).

Society of Undergraduates in Economics: <https://www.ucalgarysue.com/>.

Society of Undergraduates in Economics is a student run organization whose main purpose is to assist undergraduate economics students to succeed both academically and socially at the University of Calgary. Services include access to the exam bank, career events such as Industry Night and information sessions, mentorship programs, and social events for members. They invite you to join by contacting SUE at [societyofundergradsineconomics@gmail.com](mailto:societyofundergradsineconomics@gmail.com).

**Faculty of Arts Program Advising and Student Information Resources:**

- Have a question, but not sure where to start? The Arts Students' Centre is your information resource for everything in Arts! Drop in at SS102, call them at 403-220-3580, or email them at [artsads@ucalgary.ca](mailto:artsads@ucalgary.ca). You can also visit the Faculty of Arts website at <http://arts.ucalgary.ca/undergraduate>, which has detailed information on common academic concerns, including program planning and advice.
- For registration (add/drop/swap), paying fees and assistance with your Student Centre, contact Enrolment Services at 403-210-ROCK [7625] or visit them in the MacKimmie Tower.

**Student Support and Resources:**

- See <https://www.ucalgary.ca/registrar/registration/course-outlines> for information on campus mental health resources, the Student Ombuds Office, Student Success Centre, Safewalk, and Emergency Evacuation and Assembly.
- Online writing resources are available at <https://ucalgary.ca/student-services/student-success/writing-support>.

**Notes:**

1. Students are responsible for all assigned material, e.g., supplementary material posted on D2L, regardless of whether or not the material was covered in class.
2. Please note that the following types of emails will receive no response: emails not addressed to anyone in particular; emails where the recipient's name is not spelled correctly; anonymous emails; emails in which the sender has not identified which course and section he/she is taking; and, emails involving questions that are specifically addressed on this course outline.

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