ECON 549 A01 (CRN 21043) Computational Economics

Winter Session: 2025 01 – CRN 21043, Unit Value 1.5, Contact hours: classes 3.0, labs 1.0. Course schedule: Monday, Thursday, 2:30pm–3:50pm, Cornett Building, Room A125. Labs: Tuesday, 3:30pm–4:20pm, Clearihue Building, Room A105. Updated December 13th 2024.

UVic Land Acknowledgement

We acknowledge and respect the Lək̓ʷəŋən (Songhees and Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land continue to this day.

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Office Hours: Monday, Thursday,: 4:00-5:00pm

TA Name: There is no TA for the course.

Course Content

Calendar Description: An introduction to numerical methods and their application in economics.

The course is an introduction to numerical methods and their application in economic analysis. Steady advances in computer technology and numerical methods have changed the practice of economic science: computational skills are now an essential part of an economist's toolkit. The aim of the course is to expose students to some of the major themes and challenges of computational economics. This will involve problem-solving activities that require the numerical solution of a number of economic models, such as the AD-AS model, Cournot games, and non-linear econometric models. We will study in detail a number of economic applications, with a focus on the quantitative rather than qualitative analysis of an economic problem of interest. Moreover, students may be engaged in critical assessments of computational economics research. In the course, students will learn Python. No prior extensive programming experience is assumed, or required.

Learning Outcomes

Students will be able to:

- *Master a set of key computational methods (e.g., optimization and simulation)*
- *Write sophisticated Python codes, working with a number of popular Python libraries/modules*
- *Use applied mathematical tools to numerically solve microeconomic, macroeconomic and statistical models*
- *Analyze complex economic issues, using realistic models*
- *Manipulate data to identify interesting patterns and empirical facts, and perform estimation*
- *Provide formal quantitative evaluations of policy reforms*
- *Apply critical thinking to interpret quantitative economic outcomes*
- *Understand the pros and cons of the economics literature based on numerical analysis*

Course prerequisites/corequisites

Recommended prerequisite: ECON 545 (or equivalent advanced undergraduate course).

Textbook/Software

Textbook: There is no required textbook for the course. However, the book *Applied Computational Economics and Finance*, by M. Miranda and P. Fackler (MIT Press, 2002) is recommended. The paperback edition is reasonably priced, and it is very useful for students wanting to specialize in this field. The exercises and examples included in that book rely on MATLAB, a programming language that we will not use. Currently, an electronic version is not available.

A former PhD student and I translated into Python all the codes that will be needed. Moreover, we included all the essential material in several Python notebooks, which will be distributed during the term. For a more comprehensive treatment, please refer to the book.

Software: Python is the required programming language for the course. In order to successfully complete this course, you must be able to run a version of Python 3.5 (or higher) on a computer you have easy (and frequent) access to. There are two ways to do so. Using Anaconda is highly recommended, while the other option might work as a temporary fix.

1) Install Python and Jupyter (Lab or Notebook) with Anaconda, a free software (for students) that automatically links a number of packages and libraries we will heavily rely on:

https://www.anaconda.com/download

Ideally, you should do this before the course will start. Given the typical class size, and the different operating systems the students use, I will not be in a position to provide help with the software installation (for example, I am not a Mac user). Please, do get in touch with the computer help desk instead (helpdesk@uvic.ca):

https://www.uvic.ca/systems/services/contact/

MS Windows users should be aware that, after the installation is complete, they might have to run Jupyter as an administrator. The many Linux installations I tried worked fine.

2) The other (temporary) solution is to use the free web interface of Python and Jupyter maintained by Google (only a Google account is needed, but the drawback is that some important features cannot be enabled):

https://cybera.syzygy.ca/

Brightspace

Brightspace is used extensively for the course. All students are expected to be fully functional with the system. The lecture notes will be posted in *Brightspace.* Please note that the lecture notes online are only outlines of the actual lectures.

All announcements will be posted in *Brightspace*. Students are advised to check it frequently.

Minimum Grade Requirements

Faculty of Graduate Studies policies apply.

Grading

Grading Scheme

The grade for the course is determined as follows:

Assignments (3): 60% (three assignments submitted, and graded, each worth 20%).

Final Exam (timed project): 30%.

Participation: 10% (attendance taken randomly and engagement in class).

Assignments: They are designed for the students to learn the course material in depth. They will be posted on Brightspace, and submitted in the dedicated drop-boxes before their deadline. Students are encouraged to discuss with other classmates how to answer them. However, every student must submit their own work, independently written up, and list all people they worked with in the first page. During the term, there will be 3 assignments. All of them must be submitted (with a serious attempt at solving each question, otherwise at least 10 points will be deducted from the overall grade). Answers must be submitted in specific file formats, and further details will be provided during the term. Each assignment will count 20% towards the final grade. Note: if caught copying other students' answers, the assignment will receive a grade of 0, and will be counted directly in the overall grade for the course. In addition, the standard procedures pertaining Academic Integrity will be initiated.

The quality of both the codes and the economic interpretation of the numerical results will form the basis for the assignment grades. In the first part of the course, a higher weight will be placed on the programming component, to reward the students' efforts in learning this challenging task.

Midterm: There is no midterm exam for this course.

Attendance: I will randomly select approximately 10 lectures where I will take attendance. If you cannot attend a lecture because of a valid reason, e.g. you are sick, please notify me by email before the start of the lecture. Excused absences will not affect your attendance score.

Final exam: It will be a (take-home) timed project, taking place in the April examination period. It will be handled via Brightspace. From the moment it will be circulated, the students will have at most one day to answer it. It will cover the material presented in the whole course. It will be open-book, but students must work on each question by themselves. UVic's rules about cheating and plagiarism apply also to take-home exams. The print-outs of the codes used to generate the results must be submitted, and students might be asked to briefly explain them in dedicated Zoom meetings. Unless agreed otherwise, the final exam scheduled by the University will be the day when the answers have to be submitted.

Answers must be submitted in a specific format, and further details will be provided in the course. As per university policy, deferred final exams will be given only on the basis of documented illness or family afflictions. If the final exam is submitted late, points will be deducted per minute past the due date/time.

The quality of both the codes and the economic interpretation of the numerical results will form the basis for the assessment of the final exam. Since most economics students are hired based on the quality of the analysis they can perform, correct codes paired with comments that are lacking cannot receive high marks.

Grade concerns should be brought to the instructor as soon as possible. The grades of each assessment component are final after one week of being distributed. Students requesting to view their final exams must do so in writing, and must request it within one week of the grades being posted.

Mandatory/Essential Course Components
Submitting all assignments is mandatory. Also, failure to submit the final exam will result in a grade of N, regardless of the cumulative percentage on the course. N is a failing grade and factors into GPA as a value of 0.

Dates of Assessments, Due Dates of Assignments
Note: it is the student's responsibility to submit assignments in a timely fashion. Unless a student has a CAL accommodation, or an approved in-course extension, there will be no flexibility on when the assignments are due (or on how to submit them).

Assignments (tentative) Due Dates: The tentative deadlines are February 3rd, March 3rd, and April 4th. There may be some changes if necessary.

Grading Scale

A+	A	A-	B+	B	B-	C+	C	D	F or N
90-100	85-89	80-84	77-79	73-76	70-72	65-69	60-64	50-59	0-49

Students should review the University's more detailed summary of grading.

Missing Assessments

Should students encounter a situation where they miss an exam or cannot submit an assignment at its due date, they may qualify for an academic concession. Students are required to indicate the specific grounds on which they are requesting an academic concession and to provide a justification outlining the impact of the circumstances on their ability to complete course requirements. For in-course extensions, please [fill in the form and follow the instructions on the form](). I will not respond to informal requests of academic concessions.

Students are advised not to make work or travel plans until after the examination timetable has been finalized. Students who wish to finalize their travel plans at an earlier date should book flights that depart after the end of the examination period. Students do not qualify for an academic concession if travel plans conflict with the examination.

Course Policies

This course adheres to the policies of the Department of Economics that deal with the following issues:

- Academic concessions
- Academic integrity (plagiarism and cheating)
- Attendance
- Grading
- Inclusivity and diversity
- Late adds
- Late assignments
- Repeating courses
- Review of an assigned grade
- Sexualized violence prevention and response
- Students with a disability
- Term assignments and debarment from examinations
- Travel plans
- Waitlists

The following policies are explicitly included because of their importance:

Waitlist Policies

- Instructors have no discretion to admit waitlisted students or raise the cap on the course.
- Students on the waitlist should discuss with the instructor how to ensure they are not behind with coursework in the event they are admitted.
- Registered students who do not participate as specified in this outline during the first 7 calendar days from the start of the course may be dropped from the course.
- Registered students who decide not to take the course are responsible for dropping the course and are urged to do so promptly out of courtesy toward waitlisted students.
- Waitlist offers cease after the last date for adding courses irrespective of published waitlists.

Academic Integrity

Academic integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility. Students are expected to observe the same standards of scholarly integrity as their academic and professional counterparts. A student who is found to have engaged in unethical academic behaviour, including the practices described in the Policy on Academic Integrity in the University Calendar, is subject to penalty by the University.

Review What is Plagiarism for the definition of plagiarism. Note: Submitted work may be checked using plagiarism detection software.

Student Code of Conduct

The Humanities, Science, and Social Sciences Faculties have adopted this Student code of conduct. Please, review.

University Policies

- University Calendar - Section "Information for all students"
- Creating a respectful, inclusive and productive learning environment
- Accommodation of Religious Observance
- Student Conduct
- Non-academic Student Misconduct
- Accessibility
- Diversity / EDI
- Equity statement
- Discrimination and Harassment Policy
- Policy on Human Rights, Equity and Fairness - The University is committed to promoting, providing and protecting a positive, supportive and safe learning and working environment for all its members.

Sexualized Violence Prevention & Response

UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. Students are encouraged to learn more about how the university defines sexualized violence and its overall approach by visiting www.uvic.ca/svp . If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Contact svpcoordinator@uvic.ca.

Resources for Students

UVic Learn Anywhere - UVic Learn Anywhere is the primary learning resource for students that offers many learning workshops and resources to help students with academics and learning strategies.

Centre for Accessible Learning - Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, you are free to approach me; however, you must register with the Centre for Accessible Learning (CAL) for formal arrangements to be made. The CAL staff are available by appointment to assess specific needs,

provide referrals and arrange appropriate accommodations. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

Centre for Academic Communication - Offers coaching on **academic integrity**, including preventing accidental plagiarism. Provides support to students with time management, reading, writing, speaking, understanding academic expectations, and other aspects of academic communication as well as creating academic posters, blogposts, PowerPoint slides, and e-portfolios.

Health Services - University Health Services (UHS) provides a full service primary health clinic for students, and coordinates healthy student and campus initiatives.

Support Connect - a 24/7 mental health support service for students
•Toll-free (calls from North America): 1-844-773-1427
•International collect calls: 1-250-999-7621

Counselling Services - Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.

Indigenous Student Services - Indigenous UVic students have access to many sources of support on campus. Before, during and after your time at UVic, you are encouraged to explore programs and services available to you, such as Indigenous counselling services and the Elders in Residence, as well as non-academic programs that may be of interest to you.

International Student Support - The University of Victoria offers a number of resources to support international students as they pursue their studies. UVic's International Centre for Students is the primary office supporting international students on campus at the university-wide level and provides various supportive program through the UVic Global Community Initiative, including a Mentorship Program and Conversation Partner Program.

Course Experience Survey (CES)

I value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future.

When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to the CES log-in. You will use your UVic NetLink ID to access the survey, which can be completed on your laptop, tablet or mobile device. I will remind you nearer the time, but please be thinking about this important activity, especially the following three questions, during the course.

What strengths did your **instructor** demonstrate that helped you learn in this course?

Please provide specific suggestions as to how the **instructor** could have helped you learn more effectively.

Please provide specific suggestions as to how this **course** could be improved.

Course Structure

Topic	Chapter	Week	Due Dates and Exam Information
Introduction	1	1	
Programming Basics	1-2	1-2	
Linear Equations	2	3	
Macro Applications		4	
Non-Linear Equations	3	5	Assignment 1
Macro Applications		6 & 7	
Micro Applications		7 & 8	
Numerical Optimization	4	8	
Finance Applications		8	
Numerical Differentiation	5	9	Assignment 2
Numerical Integration	5	9 & 10	
Simulation		11	
Dynamic Applications	7-8	12	
Statistics Applications		12	Assignment 3
			Classes end on Apr 4th

549 Final Exam – it will take place sometime between April 7th-25th 2025

Important Dates: The last day for adding courses is January 22nd. The last day for withdrawing from courses without penalty of failure is February 28th.

Course Content: the main goal of the course is to teach the students a number of computational tools. These will be used to numerically solve economic and statistical models. We will consider several applications, spanning microeconomics, macroeconomics and econometrics. Given the nature of computational work, this course is structured around a practical "learning-by-doing" principle. During the term, students will code and test their own computer programs. Although no prior extensive programming experience is required, proficiency in Python will become essential as the students tackle the assignments. Python is a free programming language, whose popularity has seen a spectacular increase in recent years. The availability of several reliable libraries, together with its top-notch plotting capabilities, make it a powerful tool and a valuable asset. Lab tutorials and exercises will initially focus on basic Python programming skills, which will become more sophisticated as the term progresses. I strongly encourage the Econ 549 students to become proficient in Python. I will organize the teaching around it, and I will provide guidance and feedback on Python codes only.

E-mail Correspondence

Emails should be limited to critical matters, such as inability to attend class, an exam, or prolonged illness, and should include the course name and number in the subject line. Questions on course material should be asked during office hours or in class. The standard format for writing a letter must be used. This means it should begin with a salutation (e.g. Dear….), include full sentences and it must conclude with a signature that includes your **full name and V#**. Text message lingo should not be used. Note that it is not uncommon for Uvic's spam filters to block emails sent from non-uvic email accounts.

Electronic Devices

Countless studies unequivocally show that using electronic devices in class is detrimental to student learning. Please refrain from using your phone in class. Taking notes with paper and pencil might prove a useful commitment device to minimize the temptation of social media.

Use of AI

In this course, you are authorized to make use of generative AI (GenAI) such as ChatGPT. You can work with GenAI in all the assessed course components, i.e. both in the assignments and in the final take-home exam.

In order to not violate academic integrity, in your answers you must declare that you used ChatGPT (or other GenAI), and how you used it.

Educational Technology involving storage outside Canada

The following educational technologies, which stores or accesses your personal information outside Canada, is required for this course: Zoom. I will make you aware if this list changes.

Personal information is required by the service. The privacy policy and the terms of use list the personal information stored outside of Canada and are available at https://explore.zoom.us/en/privacy/. I encourage you to read these documents.

If you are not comfortable with your personal information being stored outside of Canada, please speak to me within the _first week_ of class about using an alternative (such as using an alias or nickname). Otherwise, by continuing in this course, you agree to the use of the educational technology in the course and the storage of personal information outside of Canada.