

Course Syllabus
ECO 326H5F L0101: Advanced Microeconomic Theory
Department of Economics
UNIVERSITY OF TORONTO MISSISSAUGA
Fall 2021

Prof. C. Pitchik
Office Hours: TBA: or by appt
email address: carolyn.pitchik@utoronto.ca
[Course web page](#)
[Quercus/Canvas Web page](#)

TA: Albi Bilali
Office Hours: TBA on Zoom or Teams
email address: albi.bilali@mail.utoronto.ca

1 Contact Hours

Synchronous on-line format: F: 10:10a.m.–1p.m. on Zoom (plan A) or Microsoft Teams (plan B if plan A fails due to Zoom failure)

The first planned Zoom meeting is 10:10a.m.–1p.m on Friday 10 September 2021. Please see the invitation in an announcement made on 9 September 2021 on our [Quercus/Canvas Web page](#).

You are expected to be available online during the Toronto local time slot 10:10a.m.–1p.m.. All lectures and tutorials are online. All office hours will feature synchronous (i.e. live) instruction. There may be a mix of synchronous instruction for the full three hours or a combination of asynchronous (i.e., pre-recorded) and synchronous instruction depending on how things unfold. Details (including Zoom/ Microsoft Teams links) will be provided on Quercus. In case you miss the online lecture, you can consult the extended lectures available on our [Course web page](#). and you can consult the class notes created using One Note which will be made available either on our [Course web page](#) or on our [Quercus/Canvas Web page](#) depending on which is easier.

2 Communication

If you have any questions about the content of the course that is not available online, please email me at carolyn.pitchik@utoronto.ca using your University email address and include ECO 326 in the subject line. I will not be checking any other source for questions. In particular, even though I may use Quercus

to communicate with you via announcements, please **do not** use Quercus to communicate with me.

3 Course Objectives

This course assumes a background in economics, calculus, and statistics to introduce game theoretic tools that can be used to analyze a wide variety of issues in an array of diverse fields that includes economics, politics, and biology. We begin by studying pure and then mixed Nash equilibria in strategic games. We then consider sub-game-perfect Nash equilibria in extensive form games. Finally, we study Bayesian, and extensive form games with imperfect information. Along the way, we apply the concepts within a rich set of diverse applications (which includes but is not limited to Cournot/Stackelberg oligopoly with externalities or with imperfect information, electoral competition, public good contribution, auctions, bargaining, ...). As in other economics courses, once we understand what equilibrium means in a model, we can then perform comparative static exercises in order to predict the effect of changes in underlying parameters on the equilibrium of the model.

Please note that you will require the skills and knowledge that you acquired in other courses including courses in Economics, calculus, and statistics. The prerequisites are not used as a screening device. You actually need to know and apply the material learned from previous courses.

In many courses there is a prescribed method to answer a specific question. In this course, the main part of the question always starts with a variant of “what is the prediction of the model?” but the method of obtaining the answer varies according to the model. The course does not offer definitive answers to a small set of questions. Rather, the course provides you with a new set of tools that you may use to analyze a wide class of problems. In order to master the material you need to practice the techniques and know how and when to apply them. It is not enough to understand what is done in class, in the text, or in the expanded online lectures. You need to test yourself by doing the questions. Like swimming or playing the violin, you don’t improve your speed or stamina while watching others swim or play. You must read and understand the expanded lectures in order to do well on the quizzes. You must do the exercises in order to do well on the tests and final exam. You must test yourself by trying previous test and exam questions without first looking at the solutions provided.

This course prepares you for some ideas that you will learn in more depth should you be admitted to graduate school. It is aimed at students who want to learn new and difficult material in order to prepare themselves for what is expected in graduate school. There is no point in taking this course unless you expect to put in a lot of work to understand the material. To be admitted to graduate school, you will need to have a decent transcript (i.e., high grades in relevant and tough courses). Each graduate department aims to admit students whose skills indicate that they will succeed in the program.

4 Recommended Texts (available at the UTM bookstore)

An Introduction to Game Theory, Martin J. Osborne, Oxford University Press, 2004, available at the bookstore.

5 Course Websites: course web page + Quercus/Canvas course page

1. Our [Course web page](#) provides information about the course and restricted material in the form of expanded lectures. It also provides test/exam tips and topics as well as past test and exam questions and solutions.

2. Our [Quercus/Canvas web page](#) provides instructions regarding how to access restricted material on our course web page and the live synchronously created lecture notes on OneNote. It also provides the means for me to make announcements etc. It is your responsibility to ensure your email account can receive announcements etc. from Quercus/Canvas.

6 Prerequisites

Prerequisites for ECO 326H5F: (1) ECO200Y5(70%) or ECO204Y5(70%) or ECO206Y5 and (2) (ECO220Y5 or ECO227Y5 or (1.0 credit from STA256H5, STA258H5, STA260H5)).

Limited Enrolment

Prerequisites are strictly enforced and must be completed before taking a course. Both the lecture and the tutorial are important ingredients of

the course. Please note that no accommodations can be made for students who have scheduling conflicts. By taking this course you acknowledge that you will be removed from the course at any time if you do not meet all requirements set by the Department of Economics. For further information you can consult the prerequisites page for ECO326 [online](#) in the program (economics) section of the 2020-2021 Academic Course Calendar [online](#).

7 Evaluation

In this course, at a minimum, there is one term test and one accumulative final exam. There may also be weekly quizzes depending on how things unfold.

- Term Test 22 October 2020
- Final exam TBD
- Weekly Quizzes TBD

If there are no quizzes, then the grade value $G(t, E)$ depends only on the test (t) and exam (E) scores and is calculated according to the following piecewise-defined formula

$$G(t, E) = \begin{cases} 0.4t + 0.6E & \text{if } t > E \text{ or } t \leq 40 \\ \left(\frac{80-t}{100}\right)t + \left(\frac{t+20}{100}\right)E & \text{if } t < E \text{ and } t \in [40, 80] \\ E & \text{if } t \leq E \text{ and } t \geq 80 \end{cases} \quad (1)$$

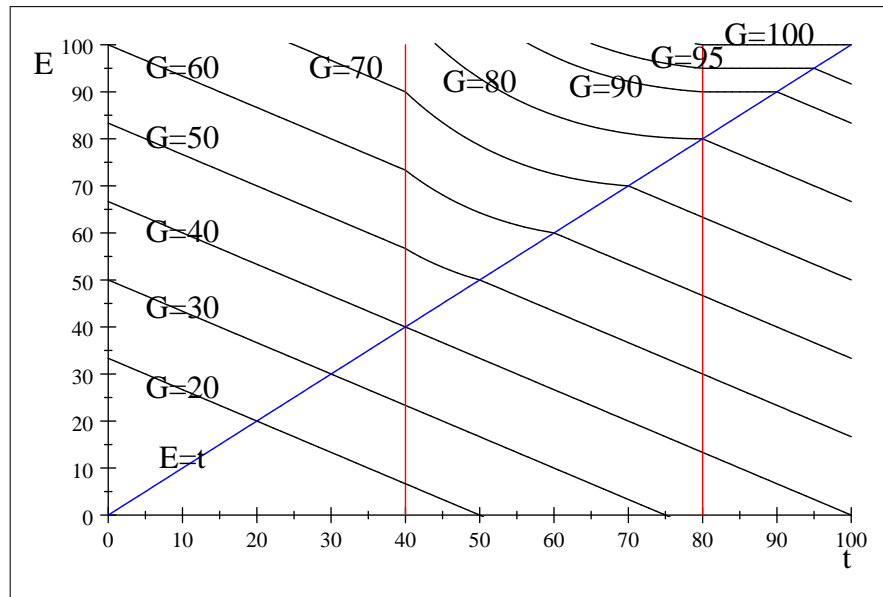
If there are quizzes then the final course grade is calculated as follows. If $q \in [0, 100]$ denotes your quiz grade, $t \in [0, 100]$ denotes your term test grade, and $E \in [0, 100]$ denotes your final exam grade, then your final course grade $F(q, t, E)$ is calculated using the following piecewise-defined formula

$$F(q, t, E) = \begin{cases} 0.2q + 0.8G(t, E) & \text{if } q > G(t, E) \text{ or } q \leq 40 \\ \left(\frac{80-q}{200}\right)q + \left(\frac{q+120}{200}\right)G(t, E) & \text{if } q < G(t, E) \text{ and } q \in [40, 80] \\ G(t, E) & \text{if } q \leq G(t, E) \text{ and } q \geq 80 \end{cases} \quad (2)$$

where $G(t, E)$ is calculated according to formula (1).

To give you another idea of the production function G as a function of the inputs $t \in [0, 100]$ and $E \in [0, 100]$, the plots in graph (3) provide, for each

value $g \in \{20, 30, 40, 50, 60, 70, 80, 90, 95, 100\}$, the isoquant labelled $G = g$ (i.e., the set of all term test grades t and final exam grades E for which the value $G = g$).

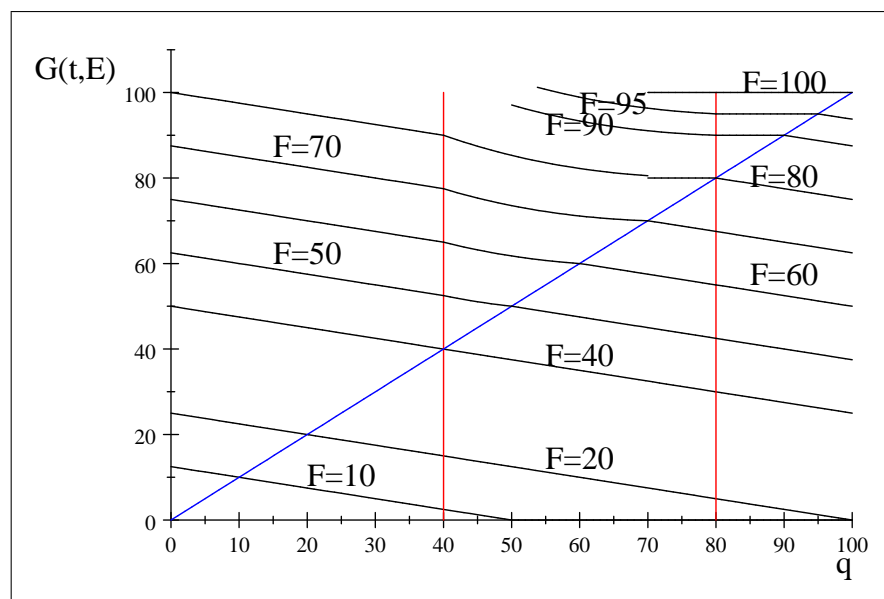


G isoquants: grades (t and E) that produce a given value ($G(t, E) = g$)

(3)

To give you another idea of the production function F as a function of the inputs $q \in [0, 100]$ and $G(t, E)$ (where $t \in [0, 100]$ and $E \in [0, 100]$) in the case that we have quizzes, the plots in graph (4) provide, for each final exam grade $f \in \{20, 30, 40, 50, 60, 70, 80, 90, 95, 100\}$, the isoquant labelled $F = f$ (i.e., the set of all quiz grades q and values $G(t, E)$ (which in turn depend on test grade t and final exam grades E) for which the final course

grade $F = f$).



F isoquants: grades (q and $G(t, E)$) that produce a given final grade (F)

(4)

8 No Late Submissions Accepted

Late submissions are not accepted. It is every student's responsibility to ensure that their online submission is submitted successfully by the due date. Accommodations will not be made for unsuccessful submissions due to, but not limited to, i) the system timing out, ii) submitting the incorrect document(s), iii) poor internet connection / no internet connection etc.

9 Regrade Request

You may submit a regrade request until 31 days from the day on which the graded assessment is returned. To submit the request, send an email to me at carolyn.pitchik@utoronto.ca. with ECO 326 regrade request in the subject matter. In the content of the email you must say which part

of which question you think has received the wrong grade. You must also explain why you think it should receive a different grade. Please refer to the expanded lectures and/or test solutions in your explanation. Please do not make frivolous requests.

10 Missed Quiz Policy

If we do have quizzes, then your grade will be based on a best of policy so that there are no make-ups for missed quizzes. If we do have quizzes and you miss all the quizzes then you need to consider taking the course at a later date.

11 Missed Test Policy

If you miss the term test without an approved reason then you are assigned a mark of 0 on the test. If you do not write the term test or its make-up, your term grade is 0. If you miss the term test due to unforeseen circumstances beyond your control, then you must submit a written explanation and supporting documentation to request an appeal to write the make-up test on the entire term's work at the end of the term. If an appeal is not received, or if the appeal is deemed unacceptable, you will receive a grade of zero for the test you missed.

Students who miss a test due to a valid and certified reason whose appeal has been granted (that is, you missed the test due to unforeseen circumstances beyond your control, you followed the 4 steps below, the department gives permission and accepts your appeal, and I accept your reason for missing the item) are eligible to write a COMPREHENSIVE make-up test ON THE ENTIRE COURSE MATERIAL in the last weeks of class. Students who are not able to keep up with the material should consider dropping the course. Eligible students who miss the make-up test are assigned a mark of 0 on the make-up test. If you miss the mid-term test due to an approved reason, then you must follow EACH of the FOUR steps below in order to submit your appeal to be approved to write a make-up test on the entire term's work in the final two weeks of class.

1. Within 24 hours, declare your absence on ACORN in order to be considered for an academic accommodation for missed tests and final ex-

ams Absences include those due to illness, death in the family, or other circumstances beyond your control.

2. Within one week of the missed test date, send me an email at carolyn.pitchik@utoronto.ca with ECO 326 missed test in the subject matter and explain the reason that you missed the test.
3. Within one week of the missed test date, complete a [Special Consideration Request](#) to request that the Department grant you special consideration for a missed test due to circumstances beyond your control (e.g. illness or an accident). Late requests will NOT be considered without a "letter of explanation" as to why the request is late. Note: The system only supports Microsoft Internet Explorer and Firefox for the time being so make sure that you install one of these browsers on your device. The University is temporarily suspending the need for a doctor's note or medical certificate for any absence from academic participation if you are experiencing medical issues. However, this policy may change at any point during the course. If you missed your test for a reason connected to your registered disability, the department will accept documentation supplied by Accessibility Services. If you visited a Dentist, Nurse/Nurse Practitioner, Physician/Surgeon, Psychologist, Psychotherapist or Social Worker registered and licensed in the Province of Ontario, have them fill out the University's [Verification of Student Illness or Injury](#) form. In other cases, a [Verification of Extenuating Circumstances](#) form is acceptable. Other documentation can include, but is not limited to, automobile collision or police reports, death certificates, and supporting documentation from employers, lawyers and other related personnel. Please email your form to economics.utm@utoronto.ca.
4. **Consult the Office of the Registrar should your absence be lengthy or affect multiple courses.**

Please note that the written explanation and documentation that you submit represents an appeal from you, requesting the opportunity to account for that portion of the grade in some other manner. If an appeal is not received, or if the appeal is deemed unacceptable, you will receive a grade of zero for the item you missed. If the appeal is granted—that is, your reason for

missing the item is considered acceptable by the professor—then a mechanism for accounting for the grade value of the missed item will be used.

Students CANNOT petition to re-write a quiz/test once the test has begun. If you are feeling ill, please do not start the online or in-class test, seek medical attention immediately, and the policy on Missed Term Work will apply.

12 Missed Final Exam Policy

In the event of a missed exam, you must file an [online petition](#). Proper documentation will be required. Consult the Office of the Registrar should your absence be lengthy or affect multiple courses.

Students who cannot complete their online final examination due to illness or other serious causes must file an [online petition](#) within 72 hours of the missed examination. Late petitions will NOT be considered. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of \$70 is required for each examination approved. At this time, the university has temporarily suspended the requirement to provide medical documentation if illness is cited as the reason for a deferred exam request.

Students CANNOT petition to re-write an exam once the exam has begun. If you are feeling ill, please do not start the online or in-class exam, seek medical attention immediately.

13 Privacy and Use of Course Materials

This course, including your participation, might be recorded on video and might be available to students in the course for viewing remotely and after each session. Course videos and materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without my explicit permission. For questions about recording and use of videos in which

you appear please contact me at carolyn.pitchik@utoronto.ca with ECO 326 video recording in the subject matter.

Each student registered in the class is required to sign a statement agreeing to abide by the above privacy rules for the use of all course material that are provided on the [Quercus/Canvas Web page](#), in the synchronous lectures shared on OneNote, or on the restricted part of our [Course web page](#). Each student who takes a test or exam in this course is required to sign a statement regarding academic integrity prior to writing the test or exam.

14 Tentative Course Outline: Lectures and Assignments (Subject to Change)

Each textbook question # tells you where in the text to find the question: for example, question 57.2 refers to the second example or exercise on page 57.

If the solution to a question is not currently available to students but might become available during the term, then the question number is in plain text, like 57.2.

If the solution to a question will not be made available to students then the question number is in plain text with two asterisks, like 67.1**. These are harder questions for those students who want a challenge. Students do not have to do questions like 67.1** for test or exam purposes.

If the solution to a question is currently available in a lecture on our [Course web page](#), then the question number is in emphasized text, like 72.3. The web address for our course is available near the top of this syllabus. I give instructions on our [Quercus/Canvas Web page](#) on how to obtain the username and password.

If the solution to a question is currently available on the textbook solutions web page then the question number is in bold text, like **44.1**. The web address is available on our [Course web page](#). As above, please obtain the username and password from me as explained on our [Quercus/Canvas Web page](#).

If the solution to a question is currently available on both the textbook solutions web page and in a lecture on our [Course web page](#), then the question number is in bold text with an asterisk, like **36.1***.

Week	Topics	Ch.	Textbook questions
1	Game Theory	1	5.3, 6.1
2	Strategic Games Nash Equilibrium Best Response	2	16.1 * , <i>18.1</i> , 20.1 * , <i>27.1</i> , <i>27.2</i> , <i>30.1</i> , 31.1 * , <i>31.2</i> , <i>33.1</i> , 34.1 * , <i>34.2</i> 34.3 * , 37.1 * , 38.1 * , 38.2 * , <i>41.1</i> , <i>42.1</i> , <i>42.2</i>
3	Dominated Actions Symmetric Games Cournot Oligopoly	3	<i>44.1</i> , 47.1 , 47.2 , <i>48.1</i> , <i>49.1</i> , <i>49.2</i> , 50.1 , <i>50.2</i> , 51.2 , 52.2 58.1 , <i>59.1</i> , <i>59.2</i> , <i>60.1</i> , 60.2 , <i>61.1</i> , <i>62.1 **</i> , <i>63.1</i> 67.1 , <i>67.2</i> , 68.1 , 68.2 , <i>69.1 **</i> 73.1 , <i>74.1</i> , <i>74.2</i> , <i>75.1</i> , <i>75.2 **</i> , 75.3 , 76.1 79.1 , <i>79.2</i> , <i>80.1</i> , <i>80.2</i> , <i>84.1</i> , 85.1 , <i>86.1</i> , 86.2 , 87.1 , <i>88.1</i> , <i>90.1</i> , <i>90.2 **</i> , 90.3 , <i>91.3</i>
4	Bertrand Oligopoly Electoral Competition War of Attrition Auctions	4	101.1 , 106.2 * , 110.1 , 111.1 114.1 * , <i>114.2-114.4</i> , 117.2 * , <i>118.1</i> , <i>118.2 **</i> , <i>118.3 **</i> , 120.2 * <i>121.2</i> , 127.1 * , 127.2 , <i>128.1</i> , <i>130.2</i> , 130.3 , 132.2 , <i>132.3</i>
12-15 Oct	READING WEEK		
22 Oct	Term Test	1-4	as above

Week	Topics	Ch.	Textbook questions
22 Oct	Term Test	1-4	as above
8	Extensive Games Nash Equilibrium SPE	5	156.2,161.1 163.1,163.2 164.2,168.1,173.2, 173.3,173.4,174.1,174.2 176.1,177.1,177.2,177.3 179.1,179.2,179.3
9	Ultimatum Game Stackelberg Duopoly Buying Votes A Race	6	183.1-.2,181.3,183.4**,185.1, 185.2**,186.1,187.1 189.1*,191.1,192.1 196.1-196.3,196.4 198.1,201.1,201.2,202.1** 203.1
10	Bargaining (16.1-16.2)	16	468.1*,468.2*,473.1,473.2
11	Bayesian Games (BNE, PBE)	9	276.1, 277.1,282.1,282.2 282.3,284.1,287.1,288.1 290.1,291.1,294.1,294.2 296.1,299.1,299.2,306.1 307.1
12	Extensive Games with Imperfect Information	10	316.1,317.1,318.2,319.3 320.1,320.2,322.1,331.1 331.2,335.1,335.2,340.1 342.1,346.1,350.1,350.2

15 Technology

- In order to take this course, you will need reliable and regular access to a laptop/desktop; a cell phone is NOT sufficient. You will also need reliable and regular access to high-speed internet. During tests and exams you will need to use two devices that have reliable access to high-speed internet (one laptop/desktop and, in addition, either a tablet or a cell phone). See the University's [Recommended Technology Requirements](#) for more details. Read also the [UTM Library Learn Anywhere resource website](#).

- Access to a computer that can support remote recording is your responsibility as a student. You will need to ensure that you can complete the test or exam using a reliable computer with a webcam and microphone available as well as a reliable, high-speed internet connection. Please note that you will be required to sign a document about academic integrity prior to writing tests and exam and that you will be required to show your T-card for tests and exams. As you may be video-recorded while writing tests and exams please do consider preparing the background (room/walls) so that personal details you would not want visible are removed or move to a room that you are comfortable showing on camera. Any test or exam recordings will be purged afterward.
- We will use Zoom for lectures, tutorials, office hours and tests but we may also use Quercus for some assessments. Although you may already have a personal Zoom account, students must create an official UTM Zoom account using their UTORid and password at <https://utoronto.zoom.us>. Always make sure you are signed into your UTM Zoom account when joining any course-related meetings. You will not be able to join otherwise. Logging in with an unofficial account will leave you stranded in the waiting room and unable to attend lectures/tutorials/office hours. If necessary, we may also use Microsoft Teams (if available within Quercus).
- There is a [Quercus/Canvas web page](#) for this course, where I will post announcements and some course materials. Make sure you check Quercus regularly. Note that this is not a substitute for attending class: there may be occasions where announcements will be made in class and will not be posted on Quercus. Notes from the on-line session may be available here or on our course web page but not both.
- There is a [Course web page](#) that is distinct from the Quercus page. Extended lectures, past tests and past exams are posted on this course web page. Notes from the on-line session may be available here or on Quercus but not both.
- In this course, we might use Piazza to facilitate communication. If we do so, then remember that Piazza is a third-party discussion forum, with many features that are designed specifically for use with courses. Be sure to read Piazza's Privacy Policy and Terms of Use carefully.

Take time to understand and be comfortable with what they say. They provide for substantial sharing and disclosure of your personal information held by Piazza, which affects your privacy. If you decide to participate in Piazza, only provide content that you are comfortable sharing under the terms of the Privacy Policy and Terms of Use.

- We will use either Quercus quizzes or Crowdmark for assessments. If we use Crowdmark, you can sign in through Quercus at <https://app.crowdmark.com/sign-in/utoronto>. In either case, you will need the hardware, software, and knowledge to scan and upload your handwritten work. You must be able to scan efficiently without creating very large files: you may need to learn about your phone or scanner, install software/updates, and/or search for solutions online. Most phones can scan (making a separate scanner unnecessary) and we accept PDF, JPG, and PNG files.
- You will need to be proactive to avoid technical and other difficulties—which includes submitting well before deadlines, maintaining your devices, minimizing the strains on your internet bandwidth, learning how to scan efficiently, carefully reading all assessment instructions, and contacting your instructors/TAs immediately with any problems.
- You need to store your work for this course in at least two places: your hard drive plus a memory card or the cloud. Make multiple backups of your files and physically store the backups in a different location from your originals or online. Remember: all hard disks will fail. Indirectly, this course measures your ability to manage computer files. Computer or file failure does not excuse you submitting your work.
- You will need the hardware, software, and knowledge to scan your handwritten work to be uploaded. You must be able to scan efficiently without creating very large files: you may need to learn about your phone or scanner, install software/updates, and/or search for solutions online. Most phone can scan (making a separate scanner unnecessary).

16 Supplement

The [Supplement to Course Syllabi \(dated August 4, 2021\)](#) of UTM's Department of Economics should be understood to be an integral part of this syllabus. It describes

- time zone information;
 - All lecture times, tutorial times, exam times, deadlines, etc. are stated in local Toronto time.
 - Toronto adheres to Eastern Daylight Time until November 7, 2021, 2:00 am, followed by Eastern Standard Time until Sunday, March 13, 2022, 2:00 am, followed again by Eastern Daylight Time.
 - Please ensure that you correctly convert local Toronto time to your time zone because missing deadlines due to confusion is not an acceptable excuse.

- information regarding prerequisites and exclusions;
 - Prerequisites for ECO 326H5F: (1) ECO200Y5(70%) or ECO204Y5(70%) or ECO206Y5 and (2) (ECO220Y5 or ECO227Y5 or (1.0 credit from STA256H5, STA258H5, STA260H5)).
 - Limited Enrolment
 - * Prerequisites are strictly enforced and must be completed before taking a course.
 - * Both the lecture and the tutorial are important ingredients of the course.
 - * Please note that no accommodations can be made for students who have scheduling conflicts.
 - * By taking this course you acknowledge that you will be removed from the course at any time if you do not meet all requirements set by the Department of Economics.
 - * For further information you can consult the prerequisites page for ECO326 in the program (economics) section of the 2021-2022 [Academic Course Calendar](#).

- your responsibility to adhere to the [Code of Student Conduct](#);
 - It is your responsibility as a student at the University of Toronto to familiarize yourself with, and adhere to, the [Code of Student Conduct](#), which is a University policy that sets out expectations for student behavior, and prescribes processes for dealing with prohibited behavior.

- The [Student’s Companion to the Student Code of Conduct](#) is a set of frequently asked questions and responses about the Code of Student Conduct. It aims to simplify and clarify Code usage for the University’s community members.
 - Lectures and tutorials for this class will be online. You are expected to adhere to the same standards regarding behaviour as in a normal classroom.
- your responsibility to adhere to the [University of Toronto’s Code of Behaviour on Academic Matters](#);
 - expectations regarding academic integrity, including examples of violations;
 - technology requirements for online learning;
 - your responsibility to avoid course conflicts;
 - your responsibility to honour the copyright of course materials;
 - your right to receive accommodations for religious observances;
 - To request academic accommodation for a test due to religious reasons, students must, at least 3 weeks prior to the test,
 - * send me an email at carolyn.pitchik@utoronto.ca with Request for Religious Accommodation in the subject matter
 - * submit a complete a [Special Consideration Request](#) (with supporting documentation) to request that the Department grant you special consideration for such accommodation.
- the equity statement for this course;
 - your academic rights;
 - some resources that are available to you as a student, including [Accessibility Services](#)