UNIVERSITY OF TORONTO

Faculty of Arts and Science Course Syllabus
Department of Statistical Sciences
Time Series Analysis
STA457H1/STA2202H1 S-LEC0201
STA457H1/STA2202H S-LEC0101 & STA457H1S LEC2001
Winter 2021

Instructor:	Tharshanna Nadarajah
Email:	`tharshanna.nadarajah@utoronto.ca`

Class Day/Time:	Thursday 9-10 AM EST STA457H1/STA2202H1 S-LEC0201
Class Day/Time:	Thursday 3-4 PM EST STA457H1/STA2202H S-LEC0101 & STA457H1S LEC2001
Office hours:	Drop-in hours (from Jan. 18th)
Teaching Assistants:	Names and office times will be posted later in our website.

1 Course Content

All lecture slides, recordings and materials will be posted on the Quercus course page. Further, any important announcements will also be posted in Quercus. Please make sure to check it regularly so you don't miss anything.

- `https://q.utoronto.ca/courses/204859`
- This is a fully online course. Live class sessions and quizzes will be held via Quercus. Students are responsible for ensuring that they have reliable internet.

Course materials provided on Quercus are for the use of students currently enrolled in this course only. Sharing (e.g., posting, providing, selling) course materials with anyone outside of the course is considered unauthorized use.

Lectures:

- We will use a mix of synchronous learning and asynchronous learning.
- Lecture slides, along with pre-recorded voice overs, will be uploaded weekly.
- We will use the scheduled lecture times for live question-answer(QA) sessions followed by a 30 minutes quiz.

2 Course Description

An overview of methods and problems in the analysis of time series data. Topics include: descriptive methods; filtering and smoothing time series; theory of stationary processes; identification and estimation of time series models; forecasting; seasonal adjustment; spectral estimation; bivariate time series models.

Course Prerequisites

STA303H1/STAC67H3/STA302H5;
MAT235Y1/MAT237Y1/MAT257Y1/(MATB41H3,MATB42H3)/
(MAT232H5,MAT236H5)/ (MAT233H5,MAT236H5)

Course Objectives/Learning Outcomes

By the end of this course, all students should have a solid understanding of methods and problems in analyzing time series data with a primary application in Economics, Business, Finance, Physical and Environmental Sciences. The course will cover theoretical and practical aspects of time series analysis, making extensive use of the R statistical software.

- Understand and reason with the basic time series concepts
- Interpret and compare different time series models
- Identify and model different types of time series data
- Perform time series modelling/forecasting and present the results
- Use R to construct time series models and conduct analysis

3 Course Materials

Textbook:

Time Series Analysis and Its Applications
With R Examples, 4th Edition
by Robert H. Shumway & David S. Stoffer.
ISBN 978-3-319-52451-1
ISBN 978-3-319-52452-8 (eBook)

Statistical Software:

We will be using RStudio for performing statistical analyses. R is a free software that can either be downloaded onto your personal computer or used in the cloud. If you choose to work with R on your personal computer, then installation will be a two step process:

- The base R framework is available for download at `http://cran.r-project.org` for Windows, Mac and Linux operating systems.
- Next, RStudio is a good integrated development environment to R (makes it simpler to work in R) and can also be downloaded for free at `https://www.rstudio.com/products/rstudio/download`.

For each assignment, it would be required that you submit a reproducible RMarkdown file with your codes and a knitted RMarkdown document as your data analysis report. To learn more about RMarkdown, refer to `https://rmarkdown.rstudio.com/index.html`.

4 Course Assessment

STA457H1/STA2202H1 S LEC0201			
Component	**Weight For Undergraduates**	**Weight For Graduates**	**Date**
Quizzes	20%	20%	9 quizzes, approximately weekly
Assignments	20%	20%	4 assignments, approximately biweekly
Test 1	15%	10%	Feb 25th at 9.00 am EST
Test 2	15%	10%	Apr. 1st at 9.00 am EST
Final Project	30%	40%	TBA

STA457H1/STA2202H S-LEC0101 & STA457H1S LEC2001			
Component	**Weight For Undergraduates**	**Weight For Graduates**	**Date**
Quizzes	20%	20%	9 quizzes, approximately weekly
Assignments	20%	20%	4 assignments, approximately biweekly
Test 1	15%	10%	Feb 25th at 3.00 pm EST
Test 2	15%	10%	Apr. 1st at 3.00 pm EST
Final Project	30%	40%	TBA

Students must complete the final project, at least one test, at least assignment 3 or 4 and six (6) quizzes in order to pass this course.

**Graduate students will be evaluated at the graduate level according to the University Assessment and Grading Practices Policy.*
***Graduate students will be required to submit a final project and recorded presentation for their report.*

Weekly Assignments and Quizzes:

There will be 9 "weekly" quizzes, that will be occurring during the last 30 minutes of the lecture time Thursdays. Quizzes will begin on Thursday, Jan. 21st and continue until the last lecture period.

- We will take the best 8 quiz marks and drop the worst quiz in the calculation of your overall quiz mark
- Missed quiz: Because only the best 8 quiz marks will be counted, we will not be making any accommodations for missed quizzes. These will receive a mark of 0, but will be dropped as part of the worst quiz marks. Therefore, you may miss one quiz without penalty.
- There are no make-up quizzes. Quizzes, beyond the one that will be dropped, will be given zero.
- There will also be 4 Assignments on Quercus course page that will collectively contribute 20% to your mark. Each will ask for an RMarkdown file and the corresponding report. There are no make-up assignments.
- Late assignments will be accepted but subject to a 20% penalty per day late. Late submissions will not be allowed beyond 48 hours of the due date.
- Assignments and quizzes can be found under Quercus Assignments in the navigation bar or through the link provided in that weekly module and will only be available during the designated time. Assignments and quizzes must be done individually.

5 Course Policies

1. We will be using the Quercus Discussion Board as an online discussion forum. All questions about course material should be posted here or asked during TA office hours. The instructor and TAs will monitor the board and will help answer questions, but students are encouraged to answer posts and help their fellow classmates.

2. TAs will hold office hours through Bb Collaborate on the Quercus course page. The office hour schedule will be posted on Quercus. It is recommended that you visit during office hours whenever you have a question about the material. It is more important than ever in an online class to have material clarified as quickly as possible. Please post your questions at least three hours before the due date. Don't wait until the last minute to ask your questions!

3. E-mail is appropriate for emergencies or private matters. Use your ***utoronto.ca** account. You will not get a response if you email from other email addresses. Write a proper email, including the course number STA457H1/STA2202HS L0201 in the subject line. The email should contain the addressee, your official name and UTORid for identification purposes. Please do not Email your instructor asking questions like "how to do problem 2 in assignment 1?", "when is Test 1?", "how to submit the assignment?". E-mails with questions like these will be ignored and should be posted on the Quercus discussion board. Otherwise, students should expect a reply within two business days.

4. You must not copy mathematical derivations, computer output and input, or written descriptions from anyone or anywhere else, without reporting the source within your work. This includes copying from solutions provided to previous semesters of this course. Please read the UofT Policy on Cheating and Plagiarism, and don't plagiarize. If I confirmed any accused of cheating, the students involved would receive a 0% mark.

5. You should join the Zoom meeting to write your quizzes and tests for this course at the scheduled class time. You must have a working webcam. The link will be available under weekly Quercus modules.

6. Please be cautious if you are trying to upload your answers for your quiz/test/assignment at the last minute, you might miss the deadline. There will be a penalty for those who submit up to 30 minutes late and quizzes/tests/final submitted more than 30 minutes late will not be accepted.

Penalty	**# of minutes late**
5%	1-5
10%	6-10
20%	11-15
30%	16-20
40%	21-25
50%	$>$ 26-30
100%	$>$ 30

7. This course follows the University of Toronto's Policies on missed assessments and requires students to complete the Absence Declaration on ACORN if an assessment is missed due to illness. In addition to completing this absence declaration form, you must report your absence to the instructor by email within 48 hours of the assessment due date to request accommodation. Other reasons for missing an assessment will require prior approval by your instructor. If approval is not granted in advance for non-medical reasons then 0% will be recorded for the missed assignment/quiz/test. Note: If you submit an assessment, it will be assumed that you deemed yourself fit enough to do so and your grade will stand as calculated. No accommodation will be made based on reports of medical, physical, or emotional distress after the fact.

8. Any requests to have marked assignment/quiz/test re-evaluated must be made in writing by email to `regradesta457@gmail.com` within 48 hours after the grades are released. The request must contain a justification for consideration. Be sure to include your official name and student number for identification purposes. The teaching team should process regrading requests within two weeks of the requested date. Please note that the teaching team reserves the right to review a part of the whole of your assignment. Hence, your marks may go down, up or remain the same.

6 Academic Integrity

Academic integrity Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the University of Toronto degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves. Familiarize yourself with the University of Toronto's Code of Behaviour on Academic Matters available at `https://www.academicintegrity.utoronto.ca/perils-and-pitfalls`
Students are not allowed to share quiz or test questions with anyone (not even with other students taking this course). Sharing questions and submitting works completed by someone else is a huge academic offence. Please stay away from this type of behaviors.

7 Accessibility Needs

The University of Toronto offers academic accommodations for students with disabilities. If you require accommodations, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible: `accessibility.services@utoronto.ca` or `http://accessibility.utoronto.ca`.

8 Schedule:

Week	Assessment	Due Dates
Jan. 11-15		
Jan. 18-22	Class Quiz 1	Jan. 21st
Jan. 25-29	Class Quiz 2 Assignment 1	Jan. 28th Jan. 27th at 5:00 pm EST
Feb. 1-5	Class Quiz 3	Feb. 4th
Feb. 8-12	Class Quiz 4	Feb. 11th
Feb. 15-19	Winter Reading Week	No Classes
Feb. 22-26	Test 1	Feb. 25th
Mar. 1-5	Class Quiz 5 Assignment 2	Mar. 4th Mar. 3rd at 5:00 pm EST
Mar. 8-12	Class Quiz 6	Mar. 11th
Mar. 15-19	Class Quiz 7 Assignment 3	Mar. 18th Mar. 17th at 5:00 pm EST
Mar. 22-26	Class Quiz 8	Mar. 25th
Mar. 29-Apr. 2	Test 2	Apr. 1st
Apr. 5-9	Class Quiz 9 Assignment 4	Apr. 8th Apr. 7th

All information in the course outline are approximate and subject to change. All the announcements about the changes will be made via Quercus which students are expected to check regularly.

9 CIA UAP Accreditation Program Policy:

Canadian Institute of Actuaries (CIA)'s University Accreditation Program (UAP) STAT457H1 is an accredited course under the UAP program. The minimum grade needed to apply for an exemption is 80. For detailed information on UAP, please visit the following webpages:

- University Accreditation Program description `https://www.cia-ica.ca/membership/university-accreditation-program---home`
- List of accredited courses offered by University of Toronto: `https://www.cia-ica.ca/membership/university-accreditation-program---home/accredited/toronto`
- How to apply for CIA exemption credits:`https://www.cia-ica.ca/membership/university-accreditation-program---home/information-for-candidates`

  Note: The CIA will grant credits to students for SOA/CAS examinations based on the achievement of the minimum Grade towards Associateship (ACIA) and Fellowship (FCIA) in the CIA. At the time of this agreement, CIA credits are recognized by the following actuarial organizations towards their respective designations:

  Casualty Actuarial Society (CAS): ACAS, FCAS
  UK Institute and Faculty of Actuaries (IFoA): FIA, AIA
  Institute of Actuaries of Australia (IAA): AIAA, FIAA
  Actuarial Society of South Africa (ASSA): AMASSA, FASSA
  American Academy of Actuaries (AAA): MAAA

  The CIA does not guarantee that credits granted to students under the CIA UAP will be recognized by any other actuarial organizations towards their actuarial designations.