

STAT 460
Time Series and Forecasting
Winter 2022

- Instructor:** Dr. Yang Lu, Office: LB 921-21 (SGW), Phone: 848-2424, Ext. 2948
Email: yang.lu@concordia.ca
- Textbook:** Introduction to Time Series and Forecasting, 3rd Edition, by Peter J. Brockwell and Richard A. Davis, Springer, 2016. The *e-BOOK* is available on the Concordia library website:
<https://link-springer-com.lib-ezproxy.concordia.ca/book/10.1007%2F978-3-319-29854-2>
- References:** *The Analysis of Time Series: An Introduction with R*, 7th Edition, by Chris Chatfield, Chapman & Hall/CRC, 2019.
Time Series Analysis and Its Applications, 4th Edition, by Robert H. Shumway and David S. Stoffer, Springer, 2017.
- Calculators:** Only calculators approved by the Department such as **Sharp EL 531** or the **Casio FX 300MS** are permitted for the class test and final examination. See <http://www.concordia.ca/artsci/math-stats/services.html#calculators> for details.
- Assignments:** Assignments are compulsory. There will be 5 assignments. Students are expected to submit his/her assignment before the beginning of class on the announced due date. **Late assignments will not be accepted.**
- Midterm Test:** There will be one midterm test, based on the material of Weeks 1-7, which will contribute up to 25% to your final grade (see the Grading Scheme below). Missed tests cannot be made up. The midterm test will be held on **Monday, March 7, 2022** in class. This exam and the final will be closed book exams.

NOTE: It is the Department's policy that tests missed for any reason, **including illness**, cannot be made up. If you miss the midterm test because of illness (*medical note required*) the final exam will count for 85% of your final grade, and the assignments will count for the remaining 15%.

Final Exam: The final examination will be three hours long and will cover all the material in the course.

NOTE: Students are responsible for finding out the date and time of the final exams once the schedule is posted by the Examinations Office. Conflicts or problems with the scheduling of the final exam must be reported directly to **the Examinations Office, not to your instructor.** It is the Department's policy and the Examinations Office's policy that **students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

Final Grade:

- a) Assignments (15%)
- b) Midterm test (25%)
- c) Final examination (60%)

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

IMPORTANT: **PLEASE NOTE THAT THERE IS NO "100% FINAL EXAM" OPTION IN THIS COURSE.**

Weeks	Chapters
1 & 2	Chapter 1: Introduction Examples of Time Series. Objective of Time Series Analysis. Simple Time Series Models. Stationary Models & Autocorrelation function. Estimation & Elimination of Trend and Seasonal Components. Testing the Estimated Noise Sequences
3, 4 & 5	Chapter 2: Stationary Processes Basic Properties Linear Processes Introduction to ARMA Processes Sample mean & Autocorrelation Function Forecasting Stationary Time Series The Wold Decomposition
6 & 7	Chapter 3: ARMA Models ARMA (p, q) Processes ACF & PACF of an ARMA (p, q) Process Forecasting ARMA Processes
8 & 9	Mid-Term Test Chapter 4: Spectral Analysis Spectral Densities The Periodogram Time-Invariant Linear Filters Spectral Density of an ARMA Process

10, 11, 12 & 13	Chapter 5: Modeling & Forecasting with ARMA Processes Preliminary Estimation Maximum Likelihood Estimation Diagnostic Checking Forecasting Order Selection Review
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Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." [*Undergraduate Calendar, Sec 17.10.2*]

Use of Zoom

Note: Zoom is included as an institutionally-approved technology. This means we have been assured of the privacy protections needed to use freely within the classroom)

Zoom will be used in this course to facilitate learning at a distance. It may be used to record some or all of the lectures and/or other activities in this course. If you wish to ensure that your image is not recorded, speak to your instructor as soon as possible.

Also, please note that you may not share recordings of your classes and that the instructor will only share class recordings for the purpose of course delivery and development. Any other sharing may be in violation of the law and applicable University policies, and may be subject to penalties.

Behaviour

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Intellectual Property

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the [Academic Code of Conduct](#) and/or the [Code of Rights and Responsibilities](#). As specified in the [Policy on Intellectual Property](#), the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#) the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.

