

Fall 2020: MATH 8090 Time Series Analysis, Forecasting and Control

Purpose of course: To provide a basic understanding of the mathematics and statistics used to analyze data that is recorded in time.

Time and place:

2:00 -3:15pm Zoom synchronous lecture (all Zoom meetings are available in Canvas). If a synchronous lecture is cancelled, a recorded video will be available.

Instructor: Xin “Sophie” Liu

Email: xliu9@clemson.edu

Office hours: 3:00 - 4:00pm MW (Zoom meetings are available in Canvas).

◆ If you are unable to meet at these office times, schedule an appointment with the professor for an alternative time.

◆ Feel free to ask questions after class.

◆ If the instructor is late, students should wait 15 minutes before leaving.

Textbook: Introduction to Time Series and Forecasting, Second Edition, by Peter J. Brockwell and Richard A. Davis.

Software for the course: A CD containing the time series package **ITSM2000**, is contained in the text. Installation instructions for ITSM2000 are given at the back of the text. You may also use R, SAS and/or MATLAB.

Other References:

1. *Time Series: Theory and Methods, 2nd Edition*, Brockwell and Davis
2. *Introduction to Statistical Time Series*, Fuller
3. *Time Series Analysis: Forecasting and Control*, Box, Jenkins and Reinsel
4. *Time Series Analysis and its Applications*, Shumway and Stoffer

Topics to be Covered in Course:

- Examples, objectives, general approaches, stationary models. [1.1,1.2, 1.3, 1.4]
- Removing trend and/or seasonality, testing an estimated noise sequence. [1.5, 1.6]
- Stationary random processes: basic properties, linear processes, introduction to ARMA processes, properties of the sample mean and autocorrelation function. [2.1, 2.2, 2.3, 2.4]
- Forecasting stationary time series, the Wold decomposition. [2.5, 2.6]
- ARMA models: ARMA(p,q) processes, the ACF and PACF, forecasting ARMA processes [3.1-3.3]
- Modeling and forecasting with ARMA processes. [5.1-5.5]
- Nonstationary and Seasonal Time Series Models [6.1-6.6]

Attendance Policy: There is no official record of your attendance. However, you are expected to attend all classes and exams.

Homework: Homework is assigned in Canvas every Thursday by midnight, and due the next Tuesday midnight. You need to submit it electronically in Canvas. All homework is required. Missed homework will receive a grade of zero. You are allowed to work with other students on the homework problems, however, verbatim copying of homework is absolutely forbidden; therefore each student must ultimately produce his/her own homework to be turned in and graded. You are also encouraged to ask the instructor for help on homework problems, after you have attempted to solve the problems on your own.

Exams: There will be two in-class exams, which will be announced at least one week in advance, and a final exam scheduled on Thursday December 10, 2020. All of them will be take-home exams. All the exams are required, and there will be no make-up exams. Missed exams will receive a grade of zero.

Homework Average	25%
First Exam	25%
Second Exam	25%
Final Exam	25%
Total	100%

- ◆ Each student is responsible for verifying his or her recorded scores (homework & midterm exams) during the semester in Canvas. Note that the total/weighted grade in Canvas may **NOT** reflect your real course grade. Feel free to talk to the professor to learn about your course grade.

Grading Scale: A = [90, 100], B = [80, 90), C = [70, 80), D = [60, 70), F = [0, 60). The instructor may assign plus/minus grades. Their quality points are

A: 4.00, A-: 3.66, B+: 3.34, B: 3.00, B-: 2.66, C+: 2.34, C: 2.00, C-: 1.66, F: 0.00.

Specific COVID-19 related information: For a student who reports testing positive or is being asked to quarantine/isolate because of exposure to the virus, it will be up to the student to inform the instructor that they will be moving to online only instruction for at least the next two weeks. Students are directed to use the Notification of Absence link in Canvas to initiate this notification, which can be found under the “Help” button on the left navigation. (For courses where Canvas is not used, the direct link to the Notification of Absence form can be found through the Division of Student Affairs site.) Additional communication via email is encouraged; students should follow up with their instructor to develop a continued plan of study for each course. Students cannot be penalized in their grade for needing to move to online instruction.

Inclement weather statement from Faculty Senate Scholastic Policy

Committee: Any exam that was scheduled at the time of a class cancellation due to inclement weather, University power outage, etc. will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next class meeting unless the instructor contacts students. Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather-related cancellation.

Official Statement of Academic Integrity “As members of the Clemson University community, we have inherited Thomas Green Clemson’s vision of this institution as a ‘high seminary of learning’. Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately and expeditiously to charges of violations of academic integrity.”

Accessibility statement: Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to a class should let the professor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848 or by emailing studentaccess@lists.clemson.edu. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student’s responsibility to follow this process each semester. You can access further information here: <http://www.clemson.edu/campus-life/campus-services/sds/>.

Clemson University Title IX (Sexual Harassment) statement: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran’s status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of

1972. This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/title-ix/>. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864.656.3181 (voice) or 864.565.0899 (TDD).

*This syllabus is subject to change at any time at the discretion of the instructor.