MATH 447: Applied Time Series Analysis
Spring 2025 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: An introduction to applied univariate time series analysis. Topics include regression techniques for modeling trends, smoothing techniques (moving average smoothing, exponential smoothing), autocorrelation, partial auto-correlation, moving average, and autoregressive representation of series, Box-Jenkins models, forecasting, model selection, estimation, and diagnostic checking, Fourier analysis, and spectral theory for stationary processes. Effective From: Fall 2010.

Number of Credits: 3

Prerequisites: Math 341 with a grade of C or better or Math 333 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 447-002	Professor A. Pole

Office Hours for All Math Instructors: Spring 2025 Office Hours and Emails

Required Textbook:

Title	*Time Series Analysis: With Applications in R*
Author	Cryer and Chan
Edition	2nd
Publisher	Springer
ISBN #	978-0387759586

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 7, 2025**. It will be strictly enforced.

COURSE GOALS

Course Objectives: This course will introduce concepts and tools for interpreting and modeling time series data.

Course Outcomes: On successful completion of this course, the student will be able to

- Describe the structure of time series data.
- Describe the mathematical structure of basic models for linear time series data: exponential smoothing, autoregressive integrated moving average (ARIMA) models.
- Perform statistical analysis of time series data, including sample statistics, model identification, model parameter estimation, hypothesis testing, and prediction.
- Describe and explain the statistical analysis of time series data (per previous bullet).
- Interpret and convey the results of a time series data analysis.

Course Assessment: Assessment of objectives is achieved through homework assignments and two examinations: a midterm exam and a comprehensive final exam.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework and Quizzes	30%
Midterm Exam	30%
Final Exam	40%

Your final letter grade will be based on the following tentative curve.

A	90 - 100	**C**	68 - 74
B+	85 - 89	**D**	50 - 67
B	80 - 84	**F**	0 - 49
C+	75 - 79		

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally

by the end of the second week of classes and no later than two weeks before the anticipated absence.

Homework: Homework problems will be assigned in class.

Exams: There will be two midterm exams held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	TBA
Final Exam Period	May 10 - May 16, 2025

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

Generative AI: The usage of artificial intelligence (AI) is permitted in this course and no citation is necessary. If you have any questions or concerns about AI technology use in this class, please reach out to your instructor prior to submitting any assignments.

ADDITIONAL RESOURCES

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Spring 2025 Hours)

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Important Dates (See: Spring 2025 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2025	Tuesday	First Day of Classes

January 27, 2025	Monday	Last Day to Add/Drop Classes
March 16, 2025	Sunday	Spring Recess Begins
March 22, 2025	Saturday	Spring Recess Ends
April 3, 2025	Thursday	Wellness day
April 7, 2025	Monday	Last Day to Withdraw
April 18, 2025	Friday	Good Friday - No Classes
April 20, 2025	Sunday	Easter Sunday - No Classes Scheduled
May 6, 2025	Tuesday	Thursday Classes Meet
May 7, 2025	Wednesday	Friday Classes Meet
May 7, 2025	Wednesday	Last Day of Classes
May 8, 2025	Thursday	Reading Day 1
May 9, 2025	Friday	Reading Day 2
May 10 - May 16, 2025	Friday to Thursday	Final Exam Period

Course Outline

Date	Lecture	Chapter	Topic
WEEK 1	1	Chapter 1	Introduction and Chapter 2 Fundamental Concepts (I)
WEEK 2	2,3	Chapter 2	Chapter 2 Fundamental Concepts (I)
WEEK 3	4,5	Chapter 2	Chapter 2 Fundamental Concepts (II)
WEEK 4	6,7	Chapter 3	Trends (I)
WEEK 5	8,9	Chapter 3	Trends (II)
WEEK 6	10,11	Chapter 4	Models for Stationary Time Series (I)
WEEK 7	12,13	Chapter 4	Models for Stationary Time Series (II)

WEEK 8	14,15	Chapter 5	Models for Nonstationary Time Series and Midterm Exam
WEEK 9	**SPRING BREAK NO CLASSES**		
WEEK 10	16,17	Chapter 6	Model Specification (I)
WEEK 11	18,19	Chapter 6	Model Specification (II)
WEEK 12	20,22	Chapter 7	Parameter Estimation (I)
WEEK 13	22,23	Chapter 7	Parameter Estimation (II)
WEEK 14	24,25	Chapter 8	Model Diagnostics
WEEK 15	26,27	Chapter 9	Forecasting
WEEK 16	**REVIEW FOR FINAL EXAM**		

Updated by Professor A. Pole - 2025
Department of Mathematical Sciences Course Syllabus, Spring 2025