ISyE 4031 – Regression and Forecasting
Class Time: Tuesday and Thursday (9:30am – 10:45am)
Location: George Tower Scheller Tower Room 0232 (In person)
Academic Term: Fall 2026

Instructor:
Xiaochen Xian, xxian@gatech.edu
Office: George Tower 815
Office Hours: Tuesdays and Thursdays 12:30-1:30pm, or by appointment on Zoom.

TA:
Yi Ling, yling63@gatech.edu
Office Hours: TBA

Catalog Course Description:
Regression analysis: multiple linear regression, diagnostics, and variable selection.
Forecasting: exponential smoothing techniques and autoregressive moving average models.

Textbook:
Forecasting, Time Series, and Regression by Bowerman, O'Connell, and Koehler, 4th Edition

Reference Book:
Forecasting: Principles and Practice by Hyndman and Athanasopoulos. https://otexts.com/fpp2/

Course Objective:
The objective of this course is to learn about regression, time series, and other forecasting models and their applications in various fields of science and engineering.

Outcomes:
At the end of this course, we hope to help you build the following skills.

- Formulate real life problems using regression and forecasting models.
- Collect appropriate data to estimate the models and understand which data are useful in solving the problem.
- Use software to estimate models from real data.
- Draw conclusions from the estimated models to solve real-life problems.

Prerequisites:
ISyE2028/ISyE3030

Software:
R and Python: The primary programming language for regression, forecasting, data analysis, and visualization.

Course Outline
Part I: *Introduction*
Brief overview of the course (Chapter 1)

Rapid review of statistical concepts (Chapter 2)
Part II: *Regression*
Simple linear regression (Chapter 3)
Multiple linear regression (Chapter 4)
Model building and residual analysis (Chapter 5)
Part III: *Forecasting*
Time series regression (Chapter 6)
Exponential smoothing (Chapter 8)
Non-seasonal Box-Jenkins models (Chapters 9 and 10)
Box-Jenkins seasonal modeling (Chapter 11)
* You are responsible for material covered in lectures even if it is not explicitly outlined in the syllabus.

Course delivery Details
In-person class only, no remote options.

Grading
Total of 100% divided into following components:

- Homework (25%).
    - There are approximately weekly to bi-weekly homework assignments, and they will be posted on Canvas.
    - NO late submission is acceptable.
    - The lowest score will be dropped at the end.
    - You may team up with another student for homework. Only one of the two students need to submit homework on canvas. Clearly state your team membership.
    - Homework should be submitted through Canvas. We JUST accept one single PDF file of solutions. Please do not submit .doc, .xls or .jpg or other formats.
    - It is not necessary to type the solutions, you can even submit the scanned version of your handwritten copy. It just needs to be neat and organized.
    - The solution key will be provided after the deadline on Canvas.
    - For questions concerning the homework, please email the TA first.
    - Requests for re-grading HW/exams/quizzes should be made within a week of returning their grades. Homework will be re-graded by the MTA (or the instructor); exams will be re-graded by the instructor.
- Midterm (25%).
    - In-person.
    - Proctored.
    - Closed book.
    - Two double-sided pages of cheat sheet allowed.
    - Midterms will be at the exact time of the original schedule of the class (75 min).
    - No make-up exams will be given unless prior arrangement is made with the instructor (with written documentation BEFORE the exam, e.g., a note from the office of the dean of students).
    - Focus on Simple and Multiple Linear Regression (see Tentative Schedule).
- Group project (20%).

    - Two to four people group, depending on the overall class size.
    - Everyone in the same group will receive equal grade.
    - Topic definition and proposal 5%, final presentation and paper 8%, technical merit 7%.
    - Final paper is optional.
    - A project will be assigned to each team of about 2 to 4 students. Students will choose and define a real-life problem, formulate it by using regression/forecasting techniques, collect/find necessary data, analyze the data, draw conclusions, and submit a project report. Project report submissions should follow appropriate technical writing requirements.
- Final Exam (30%).
    - Take-home final exam.
    - Tentatively on **December 11th 11am – 14th 11am**.
    - No make-up exams will be given unless prior arrangement is made with the instructor (with written documentation BEFORE the exam, e.g., a note from the office of the dean of students).
    - Exams are cumulative but concentration of each exam will be on the parts after the previous exam.

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Collaboration Policy

Discussion and the exchange of ideas are essential to doing academic work. For assignments in this course, students are encouraged to consult with classmates. However, after discussions with peers, students need to work through the problem by oneself and ensure that any submitted answers for evaluation are the result of their own efforts. In addition, students must cite any books, articles, websites, lectures, etc. that have helped with the work using appropriate citation practices. Similarly, students must list the names of peers with whom they have collaborated on problem sets.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

AI Policy

Generative AI tools are allowed as part of the learning and creative process in this course. They may support brainstorming, code generation, debugging, revision, and exploration. Students **must critically verify** AI-generated code, calculations, claims, and citations.

All submitted work must include a brief **AI Usage Statement** outlining:

- Which tools were used
- When they were used
- What prompts or questions were given
- How the AI output informed or shaped your final submission

You are expected to critically engage with AI-generated content and ensure that submitted work reflects your own understanding. AI must not be used to fabricate data or citations, conceal a lack of understanding, or bypass a learning objective. Use must comply with Georgia Tech's Honor Code.

Tentative Schedule

Date	**Day**	**Topic**	**Comments**
Academic-calendar-dependent dates remain tentative until the Registrar publishes Fall 2026 dates.			
25-Aug	Tue	Introduction	Chapter 1
27-Aug	Thu	Brief Statistical Review	Chapter 2
1-Sep	Tue	Simple Linear Regression I	Chapter 3
3-Sep	Thu	Simple Linear Regression II	Chapter 3
8-Sep	Tue	Simple Linear Regression III	Chapter 3
10-Sep	Thu	Simple Linear Regression IV	Chapter 3
15-Sep	Tue	Simple Linear Regression V	Chapter 3
17-Sep	Thu	Simple Linear Regression – R/Python	Chapter 3
22-Sep	Tue	Multiple Linear Regression I	Chapter 4
24-Sep	Thu	Multiple Linear Regression II	Chapter 4
29-Sep	Tue	Multiple Linear Regression III	Chapter 4
1-Oct	Thu	Multiple Linear Regression IV	Chapter 4
6-Oct	Tue	**No class**	Fall Break
8-Oct	Thu	Multiple Linear Regression V	Chapter 4
13-Oct	Tue	**Midterm Exam (tentative)**	Confirm in Canvas
15-Oct	Thu	Multiple Linear Regression – R/Python	Chapter 4
20-Oct	Tue	Model Building and Residual Analysis I	Chapter 5
22-Oct	Thu	Model Building and Residual Analysis II	Chapter 5
27-Oct	Tue	Model Building and Residual Analysis III	Chapter 5
29-Oct	Thu	Model Building and Residual Analysis IV	Chapter 5
3-Nov	Tue	Model Selection and Diagnostics – R/Python	Chapter 5
5-Nov	Thu	Time Series I	Chapter 6
10-Nov	Tue	Time Series II	Chapter 6
12-Nov	Thu	Exponential Smoothing I	Chapter 8
17-Nov	Tue	Exponential Smoothing II	Chapter 8
19-Nov	Thu	Box-Jenkins I	Chapters 9 and 10
24-Nov	Tue	Project Work Day / Optional Check-ins	

Date	Day	Topic	Comments
26-Nov	Thu	**No class**	Holiday
1-Dec	Tue	Box-Jenkins II and Seasonal Models	Chapters 10 and 11
3-Dec	Thu	Final Project Presentations	
8-Dec	Tue	Final Project Presentations / Final Review	