Syllabus for ISyE 4031 – Regression and Forecasting

1. Class Time and Location: Tuesday and Thursday 10:25 – 12:20 pm at the classroom assigned by GTE

2. **Instructor**: Dr. Jye-Chyi Lu (nickname: JC), Professor in ISyE; Taught this class in the GTE 7+ times;
   Fellow of the American Statistical Association;
   2023 and 2025 Summer CIOS Honor Roll for Large Class ISyE 4031R and
   Year 2022 CIOS Award Winner.

3. Email: JCLU@isye.gatech.edu (main communication method) – Email me for questions

4. Pre-Requisites: ISyE 2027;

   Co-Requisites: ISyE 3030 (**it is encouraged that students in GTE take ISyE 3030 and 4031 together**)

5. Office & Office Hours: 9:45 – 10:15 am & 12:30 – 1:20 pm, T, Th (at the office assigned by GTE)

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

7. **Texts: I will use notes posted on Canvas.** The book below will serve as our main reference.
   Forecasting, Time Series, and Regression (with CD-ROM) 4th Edition
   by Bruce L. Bowerman, Richard O'Connell, Anne Koehler
   ISBN-10: 0534409776; ISBN-13: 978-0534409777

8. Course **Goals/Contents**: The course will be instructed under the following three components.
   1) Simple and Multiple Regressions, Variable Selection and Model Diagnostics,
   2) Exponential Smoothing, Time-Series ARMIA Models, Seasonal ARIMAs
   3) Advanced Regressions, Time-Series Regressions, Advanced Forecasting Methods

9. **Software**: Free statistical software package R and Python will be used. R can be downloaded at http://cran.r-project.org/ This software is important for ISyE 4031 and ISyE 3030 courses and popular in many real-world applications.

10. **Grade Distribution** (might be adjusted): Exam #1(a) (20%), Exam #1(b) (12%), Exam #2 (15%), Exam #3(a) (20%), Exam #3(b) (15%), Two Computer Projects (in place of the Final Exam) (11%), Two Enrichment Projects (4%), Attendance (2% - GTE requires attendance check for every lecture – students are allowed to miss up to **three** attendances), Instructional Survey (1%). Note that there are past reports and R-codes for the take-home exams, and computer and enrichment projects. Past in-class exams (with solutions) will also be available for students.

11. Semester Grade Decisions:

    A [90, 100+], B [80, 89.999], C [70, 79.999], D [60, 69.999], F [Below 60]. When a semester score is in the borderline (e.g., 89.1 – 89.999), we will review exam grades and attendance records for grade promotion decisions.

12. Georgia Tech Honor Codes: Students are required to follow the Georgia tech honor code, which may be found at: http://osi.gatech.edu/content/honor-code

    Please pay attention to the following guidelines provided by Georgia Tech.

    1) What is not plagiarism? Plagiarizing is defined by Webster's as "to steal and pass off (the ideas or words of another) as one's own : use (another's production) without crediting the source." If caught plagiarizing, you will be dealt with according to the GT Academic Honor Code.

    2) What is authorized collaboration and what is unauthorized collaboration? Regardless whether an exam is an in-class or take-home exam, solving exam problems together is an unauthorized collaboration. If an exam is a take-home exam and it is required to write computer codes to employ software packages to perform certain computation or data analysis, the following are authorized collaboration with fellow students:

        (a) installing software systems onto your PC,

        (b) downloading data into software systems,

        (c) calling codes into your PC's software systems, and

        (d) getting computer printouts from computer screens or downloadable files.

13. **Course Learning outcomes** and their relationships to ISyE Program Outcomes:

    At the end of this course, students will be able to:

1) Formulate real life problems using regression and forecasting models.

2) Collect appropriate data to estimate the models and understand which data are useful in solving the problem.

3) Use statistical software to estimate the models from real data.

4) Draw conclusions from the estimated models to solve the real-life problems.

Course outcome \ Program Outcomes	**1. identify, formulate solve engg prob by engg, sci & Math**	**2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic**	**3 communicate with a range of audience**	**4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.**	**5. effective on a team provide leadership, collaborative and inclusive envirn, plan tasks & meet objectives**	**6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.**	**7. acquire and apply new knowledge using appropriate learning strategies**
1. Formulate real life problems using regression and forecasting models	H						
2. Collect appropriate data to estimate the models and understand which data are useful in solving the problem						H	
3. Use statistical software to estimate the models from real data							
4. Draw conclusions from estimated models to solve real life problems	H						

Evaluation of the important outcomes
The outcome 1, 2 and 4 will be assessed by the project