ECS526

General Information:
Course: Statistics for Engineering (ECS526)
Instructor: Jorge Luis Romeu, Research Professor. Dpt. Mech. & Aerosp. Eng..
Email: jlromeu@syr.edu; Web Page: http://ecs.syr.edu/faculty/romeu/
Required Textbook: Probability and Statistics for Engineers and Scientists (Walpole, Myers et al.). https://nnquan.files.wordpress.com/2013/01/probability-statistics-for-engineers-scientists-9th-edition-walpole.pdf Also, "Readings": supplementary material from the Internet (QR&CII): http://ecs.syr.edu/faculty/romeu/QR&CII.htm
Classes: Wednesdays 5:00 to 8:10 PM. Instructor reserves the right to reschedule a class, if necessary.
Office Hours: Tuesdays, 11 am to 1 pm. Wednesdays, right after class.

Course Objectives:
To review statistical theory and inference, to introduce engineering students to statistical thinking and to gain proficiency in the correct application of various statistical tools to data modeling and analysis.

Requirements:
Students are required to have an account in the SU computer system, for email communication with the Instructor and among them. In addition, students will use statistical software to solve problems and do projects. They can either use their own personal computer or SU's Minitab SW. Finally, students will work in Teams, to prepare and present (in class and at the final) their collective class projects. A detailed explanation of the required group, in-course and final projects is appended to this Syllabus.

Zero Tolerance: no type of student dishonesty, or of improper or illegal behavior, will be tolerated.

Course Syllabus (Optimal; from the Walpole-Myers textbook):

1. Probability (Ch. 2): descriptive stats, sample spaces, simple and compound events; counting rules. Event probabilities, conditional probability, independent events, Bayes rule.
2. Random Variables and Mathematical Expectation (Ch. 3 and 4): random variables, discrete and continuous probability distributions, empirical distributions, joint distributions, expectations, variance and linear combinations of random variables. Transformations.
3. Discrete Probability Distributions (Ch. 5): Uniform, Binomial, Geometric, Hypergeometric and Poisson. Continuous probability distributions (Ch. 6); Normal, Exponential and Uniform .
4. Random Samples and Sampling Distributions (Ch. 8): populations and samples; parameters and statistics; sampling distributions (t, F, Chi-Square).
5. Point and Interval Estimation (Ch. 9): CI for the mean, proportion and variance of a sample; paired samples; difference between two means, proportions and the ratio of two variances.
6. Hypothesis Testing (Ch. 10): tests for the mean, proportion and variance of one population; tests for two means, two proportions and two variances. One and two sided tests. Goodness of Fit tests. Selection of sample size.
7. Correlation and Linear Regression (Ch. 11 and 12): simple linear regression, linear model assumptions, residual analysis, multiple regression, variable selection. Assessing the Fit.
8. Analysis (ANOVA) of Variance (Ch. 13): one and two way ANOVAs, interactions; Factorial designs; model verification and residual analysis.
9. Other topics (Design of Experiments; Quality Control, Reliability) as time allows, from the remaining chapters of the Walpole & Myers textbook.

Grade Determination:

The course final grade will be based upon the following four weighted components:

1.	First Exam (around 1/3 into the course)	20%
2.	Second Exam (around 2/3 into the course)	25%
3.	Final Project (due the last day of class)	20%
4.	Weekly Presentations, HW & Participation	15%
5.	Weekly Quizzes	20%

ECS 526 Teams and Final Project

Engineers use statistics to solve problems and to take decisions under uncertainty. In addition, engineers often work in pluridisciplinary Teams and must be able to present their work to peers and non-technical personnel. Toward these goals, study groups (Teams) of four to six students, will be formed the first day of class. Students are free to exchange groups with another, as long as the Teams remain of the same size.

Groups will work collectively and will communicate via email, phone, weekly meetings, etc. There will be a Team Leader assigned to each group the first day and an elected one will replace it after their first meeting. **Teams will present assigned material** in each class, developed using statistical and simulation software (working with statistics software is one of the main course objectives). Presentations are then discussed and critiqued by their peers and graded (for 20% of the final grade). In addition, each Team will deliver a final project (for 20% of the grade) during the final exam week (in lieu of such final exam). There is a different project for each Team. Consultation is fine. Teams will work individually.

The objective of the final project is the utilization of the course material to solve a real-life problem. A Team may define and propose a problem (in writing) to the Instructor during the first two weeks of the course (based upon a simulation model or real data that will be analyzed using regression, ANOVA and hypothesis tests). After mutual agreement, the Team will work on stating the problem in statistical terms and in collecting the data and applying as many of the course's statistical procedures to it as possible. The final grade of each project will be based upon (i) the quality and correctness of the procedures implemented, as well as (ii) on the number of applicable course elements developed in said project.

Teams may propose their own project problem, which must have all the technical characteristics required, in the allotted time frame. Alternatively, Teams will work on a project topic defined by the course instructor.

At the end of the semester, each Team will present their project to the class. Each Team will hand in a complete (hard and computerized/CD) copy of all their coursework to the Instructor (not returned). Teams will provide copies of such CD for each member, as part of the course documentation. Power point presentations are mandatory.

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