IE 330 – Engineering Analytics

Harold and Inge Marcus Department of Industrial and Manufacturing Engineering
The Pennsylvania State University, University PA

CLASSROOM: Earth and Eng Sciences 114   **MEETING TIME**: MoWeFr 12:20PM - 1:10PM

INSTRUCTOR:	Hui Yang, Ph.D.
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OFFICE HOURS:	*MoWeFr 3:30pm - 5:00pm or by appointment*

TA:	Ning Liu
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OFFICE HOURS:	*TuTh 10:30am - 12:00pm*

TEACHING INTERN:	Emily Leight
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REUIRED TEXTBOOK:

An Introduction to Statistical Learning by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani

PREREQUISITE: IE 322 and CMPSC 200, CMPSC 201 or CMPSC 202

COURSE OBJECTIVES:

Industry in the 21st century is investing in a variety of sensor networks and dedicated data centers to increase information visibility. Present technological advances are bringing massive data torrents in shorter time scales. This offers unprecedented opportunities to manage, analyze, visualize, and extract useful information from large, diverse, distributed and heterogeneous data sets so as to make better decisions, improve the system performance, and optimize the operational management. Data are motivating a profound transformation in the operation management in every field of engineering and business.

This course of Engineering Analytics provides students with a quantitative background in descriptive analytics which deals with data mining, predictive analytics which deals with forecasting. Examples of analytics will be presented in various industries including manufacturing, healthcare, and distribution. The students will learn to work in settings to make data-informed decisions from large data sets.

COURSE OUTCOMES:

2.6 Gain in-depth knowledge of data storage, analysis and visualization related to m.f.g. and service domains.
4.2 Demonstrate knowledge of contemporary issues: data management, analytics, and advanced visualization.

MAJOR TOPICS:

Topic	Minimum Reading Assignment
Introduction to data analytics	Ch. 1
Statistical learning	Ch. 2
Linear regression	Ch. 3
Classification	Ch. 4
Resampling methods	Ch. 5
Unsupervised learning	Ch. 10
Data management	

GRADING POLICY

Quiz/Homework – 20%
Mini Projects – 20%
Midterm Exam – 30%
Final Exam – 30%

Exam dates will be announced as the course progresses. Final grade will be determined based on the student performance in different evaluation elements, as shown above. No make-up exams unless previous arrangements have been made. Students will be expected to attend class and prepare assignments. Habitual failure to do so will

result in a reduced grade. An incomplete grade will only be given when a student misses a portion of the semester because of illness or accident. Cheating on examinations, plagiarism and other forms of academic dishonesty are serious offenses and may subject the student to penalties ranging from failing grades to dismissal. Grading scale will be used: A: 90+; B: 80+; C: 70+; D: 60+, F: <6

CLASS POLICY

– Homework problem sets will be assigned during the semester. **Please use the assignment page as the cover page of your homework submission**. Homework solutions should be written neatly, papers **stapled**, and all steps **must** be shown clearly for full credit. Assignments not meeting these specifications will not be accepted.

– Homework is due one week after it is assigned. No late homework will be accepted. **Please submit and upload your solutions as a single PDF file to the CANVAS website. Please DO NOT submit through emails or hardcopies. Email and hardcopy submission will not be accepted and graded.** If you do not submit your homework **on the assigned due date** it will be considered late. At the end of the semester, the lowest assignment grade will be dropped.

– **Attendance:** Class attendance is strictly required. I will take attendance periodically (ROLL CALL) during the course of the semester. An extra 2 points will be added to the final grade for those whose ROLL CALL rate is greater than 80% through the semester.

– In the event of extenuating circumstances, please submit documentation (printed, signed, and dated by students and relevant authorities) to the instructor at least two days ahead of the class for approval. If it is not a university excuse, it will not be accepted. Dropping an email to me without any documentation will not be accepted.

– During class time, please **turn** your cell phones to **SILENT/VIBRATION** mode.

– Always bring your textbook to class. Also bring your calculator, notebook, pencils/pens, and eraser.

– *Exams must be taken on the scheduled exam dates.* Students are required to arrange with the instructor in advance for a make-up exam in the event of extenuating circumstances that prevent them from taking the exam as scheduled. In the event of an unforeseen emergency that prevents the student from taking the exam as scheduled, the student must provide documentation to the instructor before a make-up exam can be arranged. *Anyone missing exams without notifying me ahead of time (and/or for a reason not deemed justifiable) will not be able to make it up.*

– Exams will be closed book, closed notes. Please be sure to bring your calculator to the exam. There will be absolutely no sharing among students of calculators or any other materials. *No cell phone, computer or laptop is allowed in this exam.*

– If you believe there was an error in the grading of an exam, you may submit the entire exam for a regrade. This must be done *within one week* from the date the exam was returned. The entire exam will be regraded, so that you may gain, or lose, points by resubmitting.

COMMUNICATION AND INSTRUCTION VIA CANVAS

Communication in the course will be through official electronic means: PSU assigned e-mail address and the course website in CANVAS (https://psu.instructure.com/). DUE to the large volume of emails the instructor receives every day, please contact me via the CANVAS Email system - clicking on "Inbox" (left column in the CANVAS website) and then sending me a course email. I will respond within 24-48 hours. Students are responsible for all information conveyed during class and on CANVAS. It is the student's responsibility to make sure they are receiving their official PSU email and checking course updates in the CANVAS website.

To access CANVAS, go to: https://psu.instructure.com/

Go to Dashboard and then click on IE 330: Engineering Analytics. Check this website frequently for: Course syllabus, important announcements, homework sets, lecture notes, emails, grades, and additional resources.

INSTRUCTOR'S COMMITMENT

You can expect your instructor to be courteous, punctual, well-organized, and prepared for the lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if he is unable to keep them; and to grade uniformly and consistently according to the posted guidelines.

STUDENTS WITH DISABILITIES SERVICES

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS)

at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at http://equity.psu.edu/ods/.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at http://equity.psu.edu/ods/guidelines/documentation-guidelines). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

ACADEMIC INTEGRITY

Violations of academic honesty will be dispatched in accordance with the university policy (http://www.psu.edu/oue/aappm/G-9-academic-integrity.html).

My expectation:

− You should always put forth work that is an honest representation of your learning on the subject matter.

− **Each assignment done for this class is expected to be an individual effort.** Before an exam, students often ask me 'What is the best way to study for this exam?' My answer is always the same, 'Practice!' I truly believe that in order to fully understand this material, you must work out the problems on your own. You do not have to 'get' how to do a problem right away; let your mind go through the thinking process. For any problem assigned, we have probably done something exactly or very similar to it in class. Go through your notes and try to understand what needs to be done and why. The more problems you do, the better you will get at solving these problems. With practice, doing the calculations become second nature, so that you will not only know how to do the calculations without much thinking, but you will automatically get faster at doing them, as well.

What if you cannot solve the problem on your own?

− The key is to start the assignments as early as possible so that you can get help from the TA or myself, if needed.

− My first preference is for you to come and see either the TA or myself during office hours. We can help you understand the concepts, and you can have confidence that we will steer you in the right direction (not always the case when you rely on your friends, who are also learning the concepts for the first time).

− It is okay to discuss the *approach* with other students and why the problem should be solved using that particular method. However, this is where the discussion should end. All calculations and conclusions should be your own.

IMPORTANT DATES

Classes Begin	Monday	January 8
Regular Drop - Deadline	Saturday	January 13 at 11:59 p.m. (ET)
Regular Add - Deadline	Sunday	January 14 at 11:59 p.m. (ET)
Late Drop Begins	Sunday	January 14
Late Registration Begins	Monday	January 15
Martin Luther King Day - No Classes	Monday	January 15
Final Exam Conflict - Filing Period	Monday - Sunday	February 12 - March 4
Spring Break - No Classes	Sunday - Saturday	March 4 - 10
Late Drop - Deadline	Friday	April 6 at 11:59 p.m. (ET)
Declare Minor - Deadline (Graduating Students)	Friday	April 6
Withdrawal - Deadline	Friday	April 27 at 5:00 p.m. (ET)
Classes End	Friday	April 27

Good luck and have a great semester!