ESI3215C: Data Analysis for Industrial Applications

Class Number: 22298
Class Periods and Locations: M,F 2-3 (ARCH 0423), R 5 (FLG220)
Academic Term: Fall 2024

Instructor
McKenzie Landrum
landrum@ise.ufl.edu
(352) 294-7732
Office Hours: Posted on homepage of Canvas

Teaching Assistants
Please contact through the Canvas website

Course Description
Focuses on analysis of data encountered in ISE applications including system reliability, demand forecasting and inventory control, simulation, and quality control. Specific engineering applications are discussed through case studies. The introduction and use of computational tools to implement various data analysis techniques is also an important component of this course.

Course Pre-Requisites / Co-Requisites
MAC2312 (Calculus 2) with a minimum grade of C.

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

- Use R to model appropriate distributions for common ISE applications (for example, in modeling the remaining lifetime of a product, in monitoring the quality of a product, and in evaluating the effectiveness of a gauge, etc.)
- Understanding simple inventory control models by analyzing discrete and continuous random variables
- Examine control charts and other visual tools to determine central tendency and variation
- Develop methods to identify quality control deviations and infer quality conformance to specifications using hypothesis test procedures, compute and evaluate test statistics
- Formulate acceptance sampling plans for quality inspections using inferences regarding P-values
- Assess simulation results using confidence intervals
- Model demand forecasts with simple linear regression models and determine if these models hold
- Design quality control experiments using ANOVA procedures
- Utilize R throughout homework and case studies to statistically model systems, design experiments, and understand the basics of quality control

Materials and Supply Fees
None

Professional Component (ABET):
This course supports the ISE undergraduate program educational objectives of producing graduates who

- "will be successful professionals using industrial and systems engineering skills",
- "can acquire advanced knowledge through continuing education or advanced degree programs"
- "can become active leaders in their profession and/or community"

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- "Applied Statistics and Probability for Engineers," Wiley (2017) 7th edition D. Montgomery
    - ISBN:978-1119409533
    - Previous editions of the textbook are useful; however, the numbering of problem sets used for homework are likely to differ book by book and you will be required to solve these discrepancies.
- Lecture notes and R tutorials (posted online in Canvas)
- RStudio (a free and open-source integrated development environment (IDE) for R, which is a programming language for statistical computing and graphics)

Course Schedule

Week	Lecture Topic for the Week	Chaps.
1	Introduction to ISE and the Role of Statistics in ISE	1
2	Probability	2
3	Discreate Distributions	3
4	Discreate Distributions + Continuous Distributions	3/4
5	Continuous Distributions	4
6	Joint Probability Distributions	5
7	Data Visualization and Interpretation + Exam 1	6
8	Point Estimation and Sampling Distributions	7
9	Statistical Intervals for a Single Sample	8
10	Hypothesis Testing for Single Samples	9
11	Hypothesis Testing for Single Samples + Exam 3	9
12	Statistical Inference for Two Samples/Hypothesis Testing for Two Samples	10
13	Linear Regression	11
14	ANOVA	13
15	Thanksgiving Break	
16	Review	
Finals	Exam 3	

Course Structure

This course has five contact hours per week. These will consist of lecture and lab sessions. During the lecture sessions, the weekly lecture topics will be covered. The lab session pertains to either case study sessions or R sessions.

Case Studies

Case studies will be group (3-4 students), open-ended small engineering projects. They will be data-driven projects, focusing on the computational and conceptual aspects of probability and statistics theory pertaining to the ISE discipline. Programming in R will be a significant part of these projects. Due to their open scope nature, students are required to study and research the topic more in depth, run their hypothesis, and be able to derive meaningful results from their implementations. Students should be able to present their results in class and answer relevant questions with regard to their work. A report will be submitted for each case study.

Attendance Policy and Class Expectations

Attendance is required and will be assessed weekly with a discussion post. You will write a discussion post summarizing the main topics of that week's lectures. These discussion posts will be due Saturday at 11:59 pm and the lowest 2 grades will be dropped. These summaries can be bullet points but should have content from each lecture that week. In this you should reflect on what you have learned, ask any questions that might still have, and give feedback for that week's material.

It will be to your benefit to attend all lectures. The instructor will not repeat material in office hours just because you chose not to attend class. Lectures are there to facilitate efficient learning, not chatting with friends, surfing the net, or sleeping. You should be focused on the course material and the in-class exercises assigned, not on activities that do not involve coursework. Those who behave inappropriately will be asked to leave. If you cannot follow the lecture anymore, you can leave the class quietly; I will not be offended.

Make-Up Policy

Excused absences require appropriate documentation.

If you missed an exam due to a health problem, you will need to provide documentation that indicates the date of the visit. A note indicating that you were seen at the health center the day of the exam is not sufficient documentation of a medically excused absence from an exam. The note must say that you were medically unable to take the exam.

In case of an exam conflict, you will need to present evidence of the conflict to the instructor.

Employment interviews, employer events, weddings, vacations, etc. are not excused absences.

Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.

Evaluation of Grades

Your grade will be based on three exams, several homework assignments, case studies, and attendance quizzes.

In each exam, I will include a few challenging tasks, which only the best students will be able to answer. These are the questions that distinguish the A students.

Assignment	Percentage of Final Grade
Exam 1	20%
Exam 2	20%
Exam 3	20%
Attendance	5%
Case Studies	15%
Homework	20%

All assignments must be submitted via E-learning unless specified otherwise. Assignment deadlines are rigid. **If you do not submit before the deadline or submit the wrong file, you will receive a zero.** Only the instructor has the authority to grant late submissions.

Exam grade disputes must be made to the instructor within one week after grades are posted. Any grade dispute after the specified period will not be considered. The following describes the procedure:

(1) Within one week after your grade has been posted, e-mail the instructor requesting a grade breakdown,
(2) Compare your solution to the solution posted on the website using the detailed grade breakdown you receive,
(3) If you still have questions about your grade, to resolve the issue either go to the instructor's office hours or request an appointment.

Grading Policy

There may or may not be a curve at the end of the semester. This depends on the overall performance of the class throughout the semester.

Please keep in mind that this is a challenging and time-consuming class, and the percentage of As has historically been in the 10% range. You must study hard and perform well in every class activity in order to deserve an A.

Please note that this is a required course for ISE students. **This means that you must earn, at a minimum, a C in order to satisfy the requirement.**

Grade	Range	Grade Points
A	(93-100)	4.00
A-	(90-92.9)	3.67
B+	(87-89.9)	3.33
B	(83-86.9)	3.00
B-	(80-82.9)	2.67
C+	(77-79.9)	2.33
C	(73-76.9)	2.00
C-	(70-72.9)	1.67
D+	(65-69.9)	1.33
D	(60-64.9)	1.00
D-	(55-59.9)	0.67

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by

a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://elearning.ufl.edu/.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*:* https://distance.ufl.edu/getting-help/; *https://distance.ufl.edu/state-authorization-status/#student-complaint*.