ANALYSIS OF DATA
IE300 – SECTION A, SPRING 2025

GENERAL COURSE INFORMATION

Designated Class Times (all times CT):

Course Component	Section	Designated Time	Meeting Place	Teaching Assistant
Lecture	AL1	TuTh, 3:30-4:50PM	112 Transportation*	
Labs (enroll in one)	AD1	Mon, 5:00-5:50PM	L416 DCL*	TBD
	AD2	Tues, 5:00-5:50PM	L416 DCL*	TBD
	AD3	Wed, 5:00-5:50PM	L416 DCL*	TBD
	AD4	Thurs, 5:00-5:50PM	L416 DCL*	TBD

*** - NOTE:** The course will take place online for the first two weeks of the semester (see "Course Policies and Structure")

Credit Hours: 3 hours
Course Websites: https://canvas.illinois.edu/ (primary course website)
https://www.gradescope.com/ (submitting assignments, see "Assignment Policies" for more details)
Instructor: Douglas M. King, Ph.D. (dmking@illinois.edu)
Office Hours*: Mondays, 3:00-3:50 PM CT (on Zoom)

Teaching Assistants:
TBD **Office Hour*:** TBD
TBD **Office Hour*:** TBD
TBD **Office Hour*:** TBD
* - Office hours may also be available by appointment (please arrange by email, providing at least 24-hours advance notice)

Textbook: "Applied Statistics and Probability for Engineers", Douglas C. Montgomery and George C. Runger (6th Edition) [US Version]
Prerequisites: MATH 241 (required)
Course Type (ISE): Required (IE and SED Curricula)
Course Description: This course is intended to be an introduction to and survey of probability models and statistical analysis of data. A student should complete this course with the ability to understand how probability distributions model experiments with uncertain outcomes, and how to analyze these experiments by applying statistical methods to observed outcomes.
Learning Outcomes: Following the completion of this course, students should be able to…
([1-7]: ABET outcomes)
…understand the role of uncertainty in engineering models [1]
…understand and apply critical probability concepts (e.g., independence, expectation, variance) [1]
…identify and analyze discrete and continuous random variables [1]
…formulate and conduct statistical analyses of observed data (e.g., estimators, hypothesis tests) [1,6]
…create probability models and perform statistical analysis with the Python programming language [1,6]

COURSE STRUCTURE AND POLICIES

OVERVIEW: To best provide you with a flexible and stable academic experience to learn the course topics, the course has been structured to add flexibility and mitigate the impact of factors that could prevent you from engaging with the course.

- ***Online for the First Two Weeks*:** All class activities for the first two weeks of the semester will be held online. Lectures will be provided by prerecorded lecture videos, with additional (optional) synchronous opportunities to discuss the course and its topics. Details will be provided on Canvas.
- ***Online Assessments*:** All course assessments for the semester will be administered online. Assignments and Case Studies will be submitted through Gradescope, and Quizzes will be taken on Canvas. Exams will also be taken online, though the platform for exams has not yet been finalized. Policies for individual assessments can be found in the "Grading and Policies" section of this document. The Course Calendar pdf shows the planned schedule of all course assessments (except quizzes; see "Quiz Policies – Schedule" section of this document for more information).
- ***Lecture Videos*:** While students can attend lectures in person once the on-campus lectures begin, doing so is not required. Prerecorded lecture videos will continue to be provided throughout the semester, so students can keep up with the course content even if they cannot attend a particular lecture, or if they prefer to watch the lectures asynchronously. The Course Calendar lists the videos that correspond to the planned lecture topics for each week.

Course Announcements and Interaction Opportunities: You will have several ways to interact with the course staff and with your fellow students, and to ask course policy questions to course staff, even during the two weeks before the on-campus lectures begin.

- ***Canvas Announcements*:** Course announcements will be made throughout the semester to keep you apprised of key milestones, deadlines, and requirements. The Announcements page on Canvas will be your primary source for these. You are responsible for being aware of these announcements; please check at least once each business day to ensure prompt notification.

- ***Canvas Calendar:*** In addition to the Course Calendar pdf, important dates will also be posted in the Canvas calendar.
- ***Discussion Board*****:** A discussion board is available on Canvas where course staff will respond to course questions. Students are also encouraged to discuss their questions with one another by posting in an existing thread or creating a new thread.
- ***Office Hours*****:** For discussion of course content in a synchronous environment (e.g., outside of the discussion board). The office hour schedule is posted at the beginning of this syllabus; office hours may also be available by appointment.
- ***Email*****:** For general questions outside of office hours, as well as all student-specific questions (e.g., grade-related).
- ***NOTE – Student-Specific Questions*****:** During the course, you may have questions specifically related to your personal circumstances or grades. To maintain the confidentiality of this information, please ask these questions via email to course staff, or in an individual appointment with course staff. To preserve the confidentiality of your personal information, course staff will not respond to these questions in publicly-accessible environments (e.g., on the discussion board).

Attendance: While much of the course content can be accessed under a flexible asynchronous schedule if the student prefers, **it is expected that you will keep pace with the course as it progresses**. This includes keeping up with the lecture topics as they are covered, completing homework assignments by their deadlines, taking exams according to their (synchronous) schedule, and so forth. Please contact the instructor as soon as possible if you anticipate an extended and unavoidable period when you will be unable to access or participate in the course, or unavoidable absences during key course meetings (e.g., exams), such that accommodations beyond those provided in this syllabus are necessary and justified. Such cases will be considered on a case-by-case basis and will require University documentation (typically including, but not limited to, an absence letter from the Office of the Dean of Students).

Access to Electronic Materials: Access to electronic recordings used in this course is offered only for students enrolled in the course via the posted platforms, and only for the duration of the course. Recording or storing recordings of any course materials, including lectures, discussions, or other activities is forbidden. Sharing recorded material or posting it online is also forbidden. Any violation of these policies will be forwarded to the Office of Student Conflict Resolution for disciplinary action.

GRADING AND POLICIES

Grades will be based on the following:	Midterm exams (two)	40%	(25% and 15%, see "Exam Policies")
	Final exam	25%	
	Homework assignments	20%	
	Case studies	10%	
	Quizzes/Participation	5%	

Exam Policies (Midterms and Final):

- ***Schedule:*** Exam dates will be announced on Canvas. Midterm exams will be scheduled to take place during designated class time, and the final exam will be scheduled according to University guidelines. **Exams will need to be taken synchronously according to the designated schedule.** Please plan ahead to be available during the exams.
- ***Internet Reliability:*** Exams are planned to be taken online, and will require an Internet connection. To the greatest extent possible, please ensure you will have access to a reliable Internet connection during exams. If you lose your Internet connection during an exam, we will do our best to allow you to resume your exam, but your exam clock will continue to run while you are logged out, and we cannot guarantee that you will be able to resume your exam.
- ***Absences and Other Issues:*** To ensure that student performance is assessed uniformly, make-up exams are offered only in rare circumstances. Students who have an unavoidable, University-approved, and documented reason to be absent during a midterm exam will have their final exam score replace it when determining course grades. Make-up final examinations are offered only if required by University policy, or a student has made arrangements with their college to receive an "I" (Incomplete) grade in the course. Other missed exams will receive a grade of zero. Please notify the instructor as early as possible if you believe you will need to take a make-up exam; make-up exam arrangements will be made on a case-by-case basis. To accommodate extraordinary and unavoidable circumstances that may arise and negatively impact midterm exam performance, students who take both midterm exams will have their better midterm exam score weighted more heavily when determining their course grade; the better midterm exam will count for 25% of their course grade and the lower midterm exam will count for 15% of their course grade.
- ***Allowed Materials:*** The exams are open-book and open-notes. Calculators are allowed. Other than referencing electronic pdf documents posted by course staff to the Canvas site and accessing your own personal electronic notes, you are not permitted to access other electronic resources (e.g., software, websites, Internet resources). Contacting or otherwise consulting with other people during an exam is not permitted.
- ***Regrades:*** If you believe that an error has been made while grading your exam, please alert the instructor via email within one week after the exam scores are posted; no regrade requests will be accepted after the deadline has passed. Include rationale for why you believe additional credit is justified. Be as specific as possible; requests with insufficient rationale may be disregarded.

Assignment Policies:

- ***Schedule:*** Nine homework assignments will be collected throughout the semester. Due dates will be posted on Canvas; you will have approximately one week to complete each assignment.

- ***Platform/Submission:*** Assignments will be submitted via Gradescope. Instructions for how to submit homework assignments will be provided. Please follow these instructions carefully! **Late submissions will not be accepted!** Each student's lowest homework assignment score will be dropped.
- ***Access to Gradescope:*** Students will be added to the Gradescope roster after the tenth day of classes; an announcement will be made on Canvas once the roster has been added. If you add the course after that time or find that you do not have access to the course's Gradescope site after this announcement is posted, please contact the instructor as soon as possible.
- ***Regrades:*** After each assignment is returned, there will be a period when regrade requests will be permitted. This period will typically last for one week. No regrade requests will be accepted after the deadline has passed. Regrade requests must be made via Gradescope and must include detailed rationale for why you believe additional credit is justified. This rationale should be as specific as possible and refer to specific errors that were made in the grading (e.g., if there is evidence that some of your work may have been missed or misinterpreted by the grader, and you did not receive credit for work that you completed). Requests with insufficient rationale may be disregarded.
- ***Assignment Groups:*** You will submit assignments in groups of two to three students. These groups will be created based on a Group Preference Form that each student will complete at the beginning of the semester. All group members are expected to contribute to their group's submission to receive credit for it; please contact the instructor as soon as possible if any member of your group is not contributing or if you are not able to contact one of your group members.

Case Study Policies:

- ***Schedule:*** Several case studies will be assigned throughout the semester. These case studies will be discussed in lab and will often require you to write Python code to perform computations or analyze data. Your teaching assistant and the course instructor can help you acclimate to using Python and will be a great resource if you have questions about coding.
- ***Platform/Submission:*** Case studies will be submitted via Gradescope. Instructions for how to submit case studies will be provided. Please follow these instructions carefully! **Late submissions will not be accepted!**
- ***Case Study Groups:*** You must submit case studies in groups of two to four students, which do not need to be the same as your assignment group. The members of your group **must all be enrolled in the same lab section**, and you may form a different group for each case study. All group members' names and NetIDs must be listed on a typed cover sheet of your report (no names may be added once the report is submitted), and all members of your group will receive the same grade on the case study.
- ***Case Study Reports:*** Your case study solutions should be submitted as a written report (one per group) that contains a clear and concise written description and discussion of your results, along an appendix containing any Python code written to carry out the tasks of the case study. Guidelines will be provided.

Quiz/Participation Policies: Quizzes will be held to assess student engagement in the course and understanding of course topics.

- ***Schedule*:** Typically, quiz dates will not be announced in advance. Once posted, a quiz will be available until at least 24 hours after start of the next designated class session. For example, a quiz posted on a Monday afternoon would be available until at least 3:30PM CT on Wednesday (i.e., 24 hours after the start of Tuesday's designated class session).
- ***Platform*:** Quizzes will be held on Canvas and will be posted in the "Quizzes" module when they are available.
- ***Quiz Duration:*** Quizzes will typically be timed, and the duration of each quiz will be shown before you begin the quiz; the duration of each timed quiz will typically be 5-20 minutes.
- ***Absences*: Make-up quizzes are not offered.** Any missed quiz will receive a grade of zero. To accommodate unavoidable absences that may occur during the semester, each student's lowest quiz score will be dropped.
- ***Allowed Materials:*** The exams are open-book and open-notes. Calculators are allowed. Other than referencing electronic pdf documents posted by course staff to the Canvas site and accessing your own personal electronic notes, you are not permitted to access other electronic resources (e.g., software, websites, Internet resources). Contacting or otherwise consulting with other people during an exam is not permitted.

Computation Policies (Assignments/Exams/Quizzes): For computational questions on exams and quizzes, please report your final numerical answer; **provide at least four significant digits** to ensure that your work can be properly assessed. On homework assignments, please simplify any computations to a final numerical answer; show all your work to demonstrate your understanding of course content and allow for partial credit to be assessed.

Academic Integrity: It is expected that your exams and quizzes will contain only your own work, and that your assignments and case studies will contain only the work of your group. Any student who misrepresents their work in an exam or quiz, or group who misrepresents their work on an assignment or case study, will receive a grade of zero on that exam, quiz, assignment, or case study; other sanctions may also be pursued, as allowed by University policy. Any homework assignment, quiz, case study, or exam on which an academic integrity infraction has occurred cannot be dropped or replaced when computing a student's final course grade.

ADDITIONAL CAMPUS POLICIES

Disability-Related Accommodations: All reasonable accommodations required for students with disabilities will be offered, as ensured by Article 1, Part 1 of the Student Code. Documentation of accommodations from the Division of Disability Resources and Educational Services (DRES) must be provided before accommodations are offered. Please provide this documentation to the instructor by the end of the first week of class to ensure that accommodations can be offered in a timely manner. If documentation is provided after this time, they will be made available as soon as is practical, but may be delayed by several weeks from the time of the request. You can find more information about requesting academic accommodations by visiting the DRES website (https://dres.illinois.edu/) and selecting "Apply for Services" at the top of the page.

Religious Observances: Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus and the course calendar at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/ to request appropriate accommodations. This should be done in the first two weeks of classes, or within one week of any course deadlines announced after the second week of class.

Sexual Misconduct Reporting Obligation: The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: https://wecare.illinois.edu/resources/students/#confidential

Other information about resources and reporting is available here: https://wecare.illinois.edu/

Family Educational Rights and Privacy Act (FERPA): Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

TENTATIVE LIST OF TOPICS

- Introduction to Probability
  - Definition and interpretations
  - Sample spaces and events
  - Counting rules
  - Axioms of probability
  - Conditional probability
  - Independence
  - Law of total probability
  - Bayes' Theorem
- Random Variables (Continuous and Discrete)
  - Definition
  - PMFs, PDFs, and CDFs
  - Expectation, mean, and variance
  - Common discrete distributions
  - Common continuous distributions
  - Joint probability distributions
  - Marginal and conditional distributions
  - Covariance, correlation, and independence
  - Common joint distributions
- Introduction to Statistics
  - Definition and examples
  - Samples and populations
  - Sample mean and variance
  - Common statistics
  - Graphical representations of sample data
- Point and Interval Estimators
  - Introduction to estimation
  - Central limit theorem
  - Sampling distributions
  - Properties of estimators
  - Methods of point estimation
  - Methods of interval estimation
  - Common confidence intervals
- Statistical Hypothesis Testing
  - Formulating statistical hypotheses
  - Types of errors
  - Statistical conclusions and *p*-values
  - Hypothesis test procedures
  - Common one-sample hypothesis tests
  - Common two-sample hypothesis tests
- Linear Regression
  - Formulating linear regression models
  - Parameter estimation (least squares)
  - Confidence intervals on model parameters
  - Hypothesis tests on model parameters
  - Analysis of residuals
- Other Statistical Hypothesis Tests (e.g., ANOVA) (time permitting)

NOTE: The policies contained in this syllabus are subject to change. Any such changes will be posted on Canvas.