COURSE SYLLABUS

Instructor Charles Nuttelman BIOT D1B14 Charles.Nuttelman@Colorado.edu

Class Meeting Time

The class meets 1:55 - 3:10 p.m., MW, in BIOT B331.

Graduate Teaching Assistant

Hari Ravikavitha Hariharan.Ravikavitha@Colorado.EDU

Hari will primarily be involved with grading homework assignments in the course. He will also help grade quizzes from time to time.

Instructor Office Hours

I have reserved BIOT E1B25 on Tuesdays from 3:00-4:00 pm and Thursdays from 3:00-4:00 pm for office hours. The only exception to this is the first Thursday (1/23) of class, for which the room was not available. Instead, I will hold office hours in my office (BIOT D1B14). If you need assistance at any time, please try me via email – I find email to be a very effective way to answer questions.

Text

Applied Statistics and Probability for Engineers, **7*th Edition***, Douglas C. Montgomery and G. C. Runger, Wiley, 2020.

Software

A current or recent version of Microsoft Excel with Solver/Analysis Toolpak add-ins (earlier versions OK)***.***
Minitab (available on the Virtual Desktop) and/or RStudio – more information regarding Minitab and RStudio as the course progresses.

Why should you want to take this course?

No practical engineering work gets done without taking measurements of some type, and, in today's world, most measurements are automated with modern instrumentation and computer-based data acquisition systems. Important decisions are made based on data acquired through measurement systems; consequently, dealing with measurement errors and the appropriate application of statistical methods are critically important.

In the immediate future, you will be required to make such measurements and interpretations in your engineering lab courses, and, in the more distant future or perhaps sooner, you will be carrying out such activities in a professional setting. It is important that you be equipped with the knowledge and practice required for industrial measurement and data analysis before you are confronted abruptly with their need.

What are the objectives of the course?

Please see the **Learning Goals** hand-out for the course.

What are the prerequisites?

You will need to have completed mathematics through calculus, differential equations, and linear algebra. Computer skills required in the course will be facilitated with Excel. *We will rely heavily on basic Excel skills that you learned in CHEN 1310*. However, you will NOT need to rely upon VBA skills that you learned in that course. We will also use the Minitab program, but you will find that reasonable to pick up as you go along. *New this semester, I will likely be switching out some of the Minitab work with RStudio.*

Why do the parts of the course come in the order they do?

The content of this course follows closely the contents of the Montgomery text, and other standard texts. It is a logical building sequence, starting with the foundation topics of probability and distributions, proceeding with sample statistics and inference, and finishing with regression analysis and design of experiments. The last topic is more advanced, but the exposure provided in this course is considered to be introductory overall.

What will a typical class period be like?

The course meets twice a week for 75-minute periods each. Before most classes, you will be required to watch and interact with (by answering the in-video questions) several Learning Modules, which are short videos with required, in-video questions. *These Learning Modules will be the main way that you are exposed to new material for the first time, in addition to the daily reading assignments in the textbook*. Thus, you will come to class prepared with a general idea of the topics for that day. Then, the rest of class is aimed at solidifying those topics, answering any questions that you might have about those topics, and implementing those ideas by solving some example problems.

During class, I will make use of "clickers" both to gauge your understanding of the material and to provide multi-step questions, which you can work along with me, answering intermediate solution steps via your clicker. To make all this work well, cooperation of students is required, especially coming to class prepared, having studied the assigned reading and interacting with the Learning Modules assigned for each class.

I discourage, and effectively forbid, students taking and using the work of another student or giving their own work to another student. That is unethical and is treated more severely than you may be accustomed to. It is also unethical to possess or make reference to a complete solutions manual for the course text. See information in the "Honor Code" section below.

What are the purposes of the assignments?

Learning Modules are to be completed before the lecture for which they are assigned. If you haven't completed these items, you won't get nearly as much out of class. I would like to use the class meeting to amplify the reading material and answer questions about the parts with which you have difficulty. I do not plan to "regurgitate" text material.

Homework assignments are to provide practice exercises so that you learn better some of the methods and concepts presented in the lecture. Often, you will be developing methods that will be of use, either verbatim or with minor modifications, in later courses of your curriculum, especially Chemical Engineering Laboratory.

I have found that, after teaching undergraduate engineering students for almost 18 years, that quizzing is a natural requirement for learning. There is formative assessment (low stakes questions using repetition, practice, and feedback – this is the purpose of homework, clicker questions, and Learning Modules) and summative assessment (quizzes at the end of blocks of course material and the final exam). I find that student learning, attention, and retention of material is far superior if I provide several low-stakes quizzes throughout the semester. Thus, there are 4 low-stakes quizzes throughout the semester (30 minutes each) and a final exam at the end of the semester (all are worth far less than they would be in a typical college course).

There is also a creative project in the course, which allows you to apply the course material to a small project of your choice.

Does Dr. Nuttelman accept late assignments?

Unless you have a medical or other emergency (please contact Dr. Nuttelman as soon as possible to make arrangements), *I do not accept late work*. Unless otherwise noted, all work is to be submitted electronically on Canvas. *Everyone makes mistakes from time to time and either forgets to do an assignment or forgets to submit an assignment. This is why I drop a portion of the lowest scores on various assignments at the end of the year* (see below in "Grading Basis"). If you tell me that you are sick a few hours before a homework assignment is due, I'll say to you, "But the assignment has been available for almost a week"! Start early in preparation for if you do get sick later in the week.

Grading Basis

Category	Percentage
Clicker Questions	15%
Learning Modules	15%
Homework	30%
Quizzes (3 highest)	20%
Final Exam	15%
Project	5%

NOTE: The following will be dropped at the end of the semester:

- Lowest 5-10% of Learning Modules (exact # TBD)
- Lowest 5-10% of Clicker questions (exact # TBD)
- Lowest Quiz (NOTE: the Final Exam cannot be dropped)
- Lowest Homework assignment

Clicker Questions

We will be using iClicker to enhance active learning and participation in the course. You will need to have an iClicker student app account, register your clicker there (https://buffportal.colorado.edu/card/cuclicker), and download and set up the app BEFORE you get to class.

During each class, I will ask/present 2-5 clicker questions to test your understanding of the material and to help guide you through in-class examples. Each clicker question throughout the semester has the same weight. It is important not to miss those classes with many clicker questions (but you won't know the number of clicker questions for each class – it's important to attend class!).

Clickers are worth 15% of your final grade in the course and I will drop the lowest 5-10% of scores at the end of the semester due to absences (illness, conferences, etc.) and for Clicker responses not going through (it will happen to everyone). No need to let me know if you will be absent unless you have an extended absence; in that case, we can discuss alternate arrangements.

Please visit this link to join the course: https://join.iclicker.com/OZDJ

Pre-Class Learning Modules

On most lecture days, there are Learning Modules on Canvas (online) that are due by 1:00 PM each day of class. A Learning Module consists of a short (typically 4-9 minutes) screencast with 1-5 in-video questions that you must answer. These are designed to keep you on track with learning the course material and to prepare you for lecture. Learning Modules (LMs) are available one week before they are due (e.g., Monday LMs are due by 1:00 PM and become available the previous Monday at 3:00 PM; Wednesday LMs are due by 1:00 PM and become available the previous Wednesday at 3:00 PM). Be sure to plan ahead and *START EARLY*. There is *NO PENALTY FOR COMPLETING THEM EARLY!*

Each Learning Module has the same weight/value. If there is only one Learning Module assigned on a given day, this is worth only a quarter of the points on a day when four Learning Modules are assigned. Thus, it is important not to miss Learning Modules on the days when several of them are assigned and due. You have the opportunity to answer most in-video question twice (i.e. you have two attempts for each question) and there is a participation component of each Learning Module (i.e., even if you miss all questions in a LM, you will still get 50% of the credit for "participating", as long as you watch the entire video).

IMPORTANT: The lowest 5-10% of pre-class Learning Modules are dropped at the end of the year. This is in case you are sick, absent, accidentally forget to do them, or in the chance that they "just don't go through" or your "dog ate your computer."

Quizzes/Final Exam

There are 4 "low-stakes" quizzes throughout the semester and a Final Exam at the end of the semester. The first four of these take up the first 30 minutes of specified class periods (see below for schedule). The Final Exam takes place during the scheduled final exam time/location as specified by the university.

The highest 3 of the first 4 quizzes will combined count for 20% of your final grade; the lowest of the first 4 quizzes will be dropped. The Final Exam is worth 15% of your final grade in the course.

The quizzes and the Final Exam give you the opportunity to demonstrate, independently, that you have learned the concepts and methods of the course. Students who are on top of the material and have completed all their assignments generally score highly on the quizzes. *You should note that quizzes are only moderately important when it comes to your final grade*, representing only 35% (20% for Quizzes 1-4 and 15% for the Final Exam) of your grade.

Quiz Schedule

Quizzes are open book/open note and will take up the first 30 minutes of the following class periods:

Quiz 1	Wednesday, February 5th, 1:55-2:25 PM
Quiz 2	Wednesday, February 26th, 1:55-2:25 PM
Quiz 3	Wednesday, March 19th, 1:55-2:25 PM
Quiz 4	Wednesday, April 16th, 1:55-2:25 PM

Final Exam Schedule

The Final Exam is a cumulative quiz over the entire course material. It will occur in the normal lecture room (BIOT B331) during the course's Final Exam time slot, which is MONDAY, May 5th from 4:30-7:00 PM. The Final Exam cannot be dropped. It is worth 15% of your final grade in the course.

Project

Students are required to complete an open-ended group project throughout the semester. This will be worth 5% of your final grade in the course and will require a short write-up. For the project, you'll have the opportunity to investigate an area of your personal interest, and there is significant potential for creativity. The project will be due on Thursday, 5/1. More information on the projects will be provided throughout the semester. A creativity prize (or prizes) will be awarded for the most creative projects in the class.

Classroom Behavior

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, marital status, political affiliation, or political philosophy.

For more information, see the classroom behavior policy, the Student Code of Conduct, and the Office of Institutional Equity and Compliance.

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or DSinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website.

Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. Understanding the course's syllabus is a vital part in adhering to the Honor Code.
All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: StudentConduct@colorado.edu. Students found responsible for violating the Honor Code will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Visit Honor Code for more information on the academic integrity policy.

IMPORTANT – Academic sanctions from the Department of Chemical and Biological Engineering: If you are caught for academic dishonesty associated with:

- Clicker Questions
- Learning Modules
- Quizzes
- Homework Assignments

the Department of Chemical and Biological Engineering recommends that

1. All involved students **fail the course**.
2. The incident is reported to the Honor Code Council honor@colorado.edu.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits protected-class discrimination and harassment, sexual misconduct (harassment, exploitation, and assault), intimate partner abuse (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and off-campus. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email CUreport@colorado.edu. Information about university policies, reporting options, and support resources including confidential services can be found on the OIEC website.

Please know that faculty and graduate instructors must inform OIEC when they are made aware of incidents related to these policies regardless of when or where something occurred. This is to ensure that individuals impacted receive outreach from OIEC about resolution options and support resources. To learn more about reporting and support for a variety of concerns, visit the Don't Ignore It page.

Religious Accommodations

Campus policy requires faculty to provide reasonable accommodations for students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please communicate the need for a religious accommodation in a timely manner.

See the campus policy regarding religious observances for full details.

Mental Health and Wellness

The University of Colorado Boulder is committed to the well-being of all students. If you are struggling with personal stressors, mental health or substance use concerns that are impacting academic or daily life, please contact Counseling and Psychiatric Services (CAPS) located in C4C or call (303) 492-2277, 24/7.

Free and unlimited telehealth is also available through Academic Live Care. The Academic Live Care site also provides information about additional wellness services on campus that are available to students.