

1EGN 3443: Probability and Statistics for Engineers
A General Education Course in Information and Data Literacy

Session Meetings: TTh 11:00am to 12:15pm CMC 141
Recitation Meetings: F 9:30am to 10:20am CIS 1048
Fall 2024

University of South Florida

SYLLABUS

Instructors

Mingyang Li, Ph.D.

mingyangli@usf.edu

Office: ENC2203 (Please make appointment via email for in-person meeting)

Office Hours: Microsoft Teams (Friday, 3.00 pm – 4.00 pm or by appointment)

Sheila Gobes-Ryan, PhD

gobes@usf.edu (Preferred communication method – Canvas messages)

Office: ENG 212 (Please make Canvas message request in advance for an in-person meeting)

Office hours: Tuesday and Wednesday 1:00 – 2:00 pm on MS Teams unless requested in advance. Make appointment through MS Booking link on Canvas. Appointments may be scheduled at other times if you are in class or working during normal office hours or office hours are fully booked

Open Help Sessions: Monday 5:30-6:30 pm and Friday 1:00 – 2:00 pm (see *Meet Your Instructors* link on Canvas home page for the Teams meeting link).

Teaching Assistant (math)

Viet Nguyen Ca Hoang

Email: cahoang@usf.edu

Office hour: Tuesdays and Wednesdays 2-4pm (ENC 2004)

Grader (math)

Jayasree Dinnipati

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This course is part of the University of South Florida's General Education Curriculum. It is certified for Information and Data Literacy. Students enrolled in this course will be asked to participate in the USF General Education assessment effort. This will involve submitting copies of writing assignments for review via Canvas.

Course Description

The world is divided into two realms: deterministic and probabilistic. Your math, physics, and chemistry course preparation to date has concentrated on “deterministic” models: a given set of inputs or conditions repeatedly produce a fixed, completely predictable output. This course launches your modeling skills into a new dimension wherein a given set of inputs or conditions produce random (or “chance” or “probabilistic” or “stochastic”) outcomes. Examples include the characteristics of products leaving manufacturing lines (e.g. lifetime of a bulb, concentration of a therapeutic drug), results of laboratory experiments (e.g. growth rates of microorganisms) or processes observed over space or time (e.g. spatial distribution of soil contaminants or time series of rainfall amounts). The field of statistics deals with the collection, presentation, analysis, and use of data to make decisions, solve problems and design products and processes.

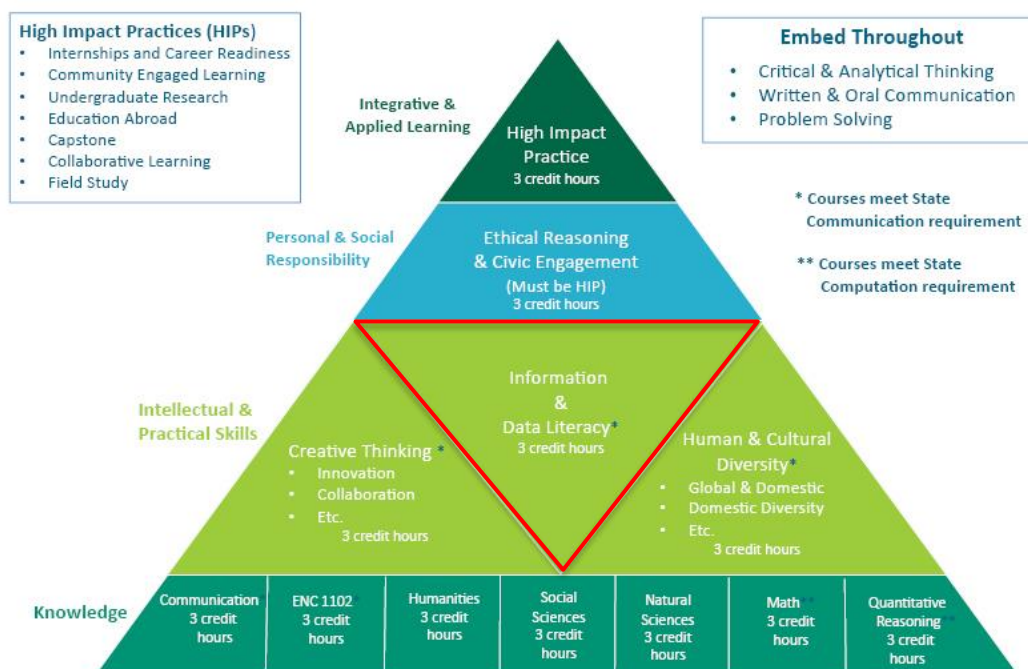
The first part of the course will be devoted to the presentation of probabilistic concepts which form the building blocks of all statistical procedures that will be introduced in the second (more applied) part of the course. Information and Data Literacy assignments are embedded throughout the course to help you develop and exercise the skills for critical thinking, problem solving, critical interpretation of data (SLO2), compare opposing claims on the same hypothesis (SLO5) and professional communication of statistics.

Relevance

“To understand God’s thoughts, we must study statistics, for these are the measures of his purpose.” Florence Nightingale

While the above quote may be a bit overstated, knowledge of probability and statistics will certainly prove useful regardless of the career one chooses to pursue. In academia, probability and statistics find applications in engineering, the biological sciences, the social sciences, and management science. (Thus, knowledge of probability and statistics is a prerequisite for many courses you will subsequently take.) Academicians frequently employ probability and statistics in the form of hypothesis testing, time series analysis, stochastic modeling and in many other manners. In business professions, there are myriad applications including design of experiments (DOE), computer simulation and modeling, decision analysis, and others. Finally, in our personal lives, a good grounding in probability and statistics helps us “tell the liars from the statisticians.”

General Education Student Learning Outcomes (SLO)



Link to General Education Student Learning Outcomes (SLO)

This course explicitly addresses two of the student learning outcomes in the Information & Data Literacy category. Specifically, the course will enhance students’ ability to:

1. critically interpret quantitative evidence (such as graphs, tables charts) in order to identify false claims, incorrect use of evidence or contradictory statements (SLO 2), and
2. critically compare and contrast opposing claims regarding the same fact or hypothesis, when the various sides are credible according to discipline-specific indicators of authority (SLO 5).

Link to ABET Student Learning Outcomes (SO)

This course explicitly addresses two of the ABET student learning outcomes. Specifically, the course will enhance students’ ability to:

1. ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (SO 1), and
2. ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions (SO 3).

Course Objectives

1. Students will develop a working knowledge of statistics, probability modeling and their application to various processes.

2. Students will enhance their problem-solving skills and ability to think analytically.
3. Students will gain an appreciation for the interesting historical context of some of the probability and statistics concepts they will learn and employ.
4. Students will learn to communicate technical material to non-technical audiences for various purposes.
5. Students will learn to read, and interpret, data from text, tables and graphs and learn to make an argument with statistics.

Assessment Matrix

	Gen Ed		ABET		Critical Thinking	Problem Solving	Communicating
	SLO 2	SLO 5	SO1	SO3			
Homework							
<i>Numerical Problems</i>	X	X	X	X	X	X	X
<i>IDL Assignments</i>	X	X	X	X	X	X	X
Course Participation			X	X	X	X	
Tests	X	X	X	X	X	X	X

Format and Procedures

Class lectures and discussions will be used in addition to the textbook, other short readings, brief videos, and written handouts to present ideas both theoretically and by example. Primarily, tests and written assignments will be used to assess understanding of basic knowledge. Enrollment in the course is an agreement to abide by and accept all terms. Any student may elect to drop or withdraw from this course before the end of the drop/add period.

Prerequisites

No previous knowledge of probability and statistics is assumed; however, a fluent understanding of calculus and linear algebra is required. Students are also expected to demonstrate college level writing skills, ideally have completed the required English courses. Familiarity with Word, Excel, and Minitab is an advantage. Finally, a will to work hard and put forth an honest effort is required. A large portion of the learning that occurs will happen outside of the formal classroom. Therefore, it is incumbent upon you to get the most out of the experience. I anticipate you will spend 4-5 hours outside of class studying, thinking, or doing homework for every hour spent in class.

Coursework Feedback and Grading

There will be information and data literacy assignments, four quizzes, one midterm, and one final comprehensive exam. All course work has dates assigned that cannot be missed.

The course grade will be determined as follows:

Information and Data Literacy Assignments	20%
Quizzes (4):	20%
Midterm exam (1):	28%
Final comprehensive (1):	32%

Final grades will be based on a straight scale: >90 A, 80-89 B, 70-79 C, 60-69 D, <60 F. Assignment grades may be adjusted depending on class performance. These adjustments will occur after each exam if instructors believe an adjustment is necessary. Note: The College of Engineering only accepts grades of C or better in all Math, Science, and Engineering courses.

Exams and Quizzes

- All quizzes and exams must be taken in person on the scheduled day and time (see class schedule on page 7). All students, on-campus and online must take in the assigned classroom space. There is no online submission of these activities. The final exam will be administered as per the final exam schedule produced by the University. All students must take exams at the same time.
- All quizzes and exams will be open-book and open-notes. Students are also allowed to bring calculators. All other electronic devices, such as computers, cell phones and cameras, are NOT allowed.
- In case of online students, they can either: i) Use a Human proctor service or ii) Use USF testing services.

Note: If there is a weather or other emergency, students are responsible for monitoring class announcements for alternative scheduling.

Grading – All quizzes are graded; absent students will receive a zero. There is no make up for exams or quizzes without a documented University approved medical excuse. Students must complete makeup exams or quizzes within one week of the scheduled exam or quiz. This means you must submit your documenting paperwork to the Instructor one or two days after an evaluation to allow time for the quiz or exam to be scheduled in that period.

Information and Data Literacy Assignments (IDL)

Information and data literacy assignments emphasize critical interpretation and communication of quantitative evidence, comparisons of opposing claims, critical thinking, and problem-solving skills. As practicing professionals, students need to be able to effectively communicate the results and implications of the outcomes of data analysis to a range of audiences, which is as important as the work itself.

Assignments - There are three IDL assignment series, each having multiple elements all posted on Canvas. Six workshops with graded work will be held over the course of the semester to review elements of the assignments. Open help sessions will be scheduled through MS Teams to provide opportunities to ask questions as you complete your work.

Assignment Deadlines - No late information and data literacy assignments will be accepted beyond the assignment closing. Assignments submitted after the assignment is due but before it closes will be penalized 10% of the earned grade. University recognized valid emergencies with confirming paperwork must be provided to Dr. Gobes-Ryan through Canvas messages within 48 hours of assignment due dates. Qualifying late assignments must be submitted through the Canvas assignment as agreed to with Dr. Gobes-Ryan but no later than one week after the deadline. Assignment extensions due to SAS accommodations must be discussed and approved with Dr. Gobes-Ryan prior to the original assignment deadline and be submitted on the Canvas assignment within one week of that deadline.

Grading – IDL assignments will have 200 points total, that count for 20% of your final grade. Grading and feedback on assignment submittals will be provided on the rubric on the Canvas assignment released to all students after the assignment is graded. Please take advantage of Dr. Gobes-Ryan's office hours for questions on how to improve future assignments. Questions on assignment grading must be reviewed in a meeting with Dr. Gobes-Ryan within two weeks of the grade release, except for the final assignment where you have 48 hours.

Classroom Etiquette, Plagiarism, and Academic Integrity

The highest standards for respectful, ethical, and honorable behavior are expected of everyone in the classroom. Please be courteous with respect to your fellow classmates and your instructor. Cellular phones should be set to vibrate so as not to disturb other members of the class. Further, cheating will be severely punished including the possibility of failure of the course.

According to USF Academic Policy, cheating is defined as follows: (a) the unauthorized granting or receiving of aid during the prescribed period of a course-graded exercise: students may not consult written materials such as notes or books, may not look at the paper of another student, nor consult orally with any other student taking the same test; (b) asking another person to take an examination in his/her place; (c) taking an examination for or in place of another student; (d) stealing visual concepts, such as drawings, sketches, diagrams, musical programs and scores, graphs, maps, etc., and presenting them as one's own; (e) stealing, borrowing, buying, or disseminating tests, answer keys or other examination material except as officially authorized, research papers, creative papers, speeches, other graded assignments, etc. **Evidence of any type of plagiarism will result in the severest of penalties.**

- Incremental plagiarism is when you advance an idea as your own when someone else said it first.
- Patchwork plagiarism is when you consult a variety of sources and string together paragraphs and sentences as if they were your own.
- Global plagiarism is when you purchase or obtain a paper that was composed by someone else and turn it in as if it were yours.
- Inappropriate paraphrasing is where you use the text of someone else and modify words and or sentence structure.

All are serious. All are punishable. If in doubt, ask!

Course Policy on Acceptable Use of Generative AI Tools

1. **Definition of Generative AI Tools:** Generative AI tools refer to any artificial intelligence-powered software, program or application that can generate content, including but not limited to text, visuals, music, and other creative outputs. Examples of these tools include AI text generators, AI content rewriters, AI graphic generators, etc.
2. **Permitted Use:** The use of generative AI tools is permitted for course-related submissions and in the specific applications listed in each assignment. Students must responsibly use these tools, adhering to the guidelines outlined in this policy and specified in the Canvas course assignments.
3. **Student Responsibility:** Students are responsible for appropriately using generative AI tools in their work. This includes:
 1. Citing all AI-generated content used in their submissions as demonstrated on the course Canvas shell.
 2. Demonstrating a deep understanding of the subject matter, not solely relying on AI-generated content. Cross-reference claims and statements with original sources and providing appropriate citations are expected.
 3. Using AI tools as a supplemental resource (i.e., as an editor), not as the primary means of completing assignments. The use of AI must be limited to initial brainstorming and final revision and editing. The core ideas presented must be yours.
 4. Understanding that generative AI tools, while powerful, are not infallible and can produce misinformation or inaccurate results. Students are responsible for the accuracy of their submissions and must cross-verify the information produced by these tools with reliable sources. You are responsible for AI provided revisions, editing, citations, and citation formats, be sure you are the final review of your own work.
4. **Violation Consequences:** Misuse of AI tools, including use of AI that undermines the student learning objectives of the course or assignment, failing to cite AI-generated content, relying too heavily on AI for work completion, or submitting inaccurate information generated by AI tools, will be subject to academic penalties. AI used for brainstorming must be uploaded as a second document with the assignment and clearly labeled as AI generated material. Consequences may range from a reduction in an individual assignment grade to larger academic sanctions per USF policy, depending on the severity of the violation (USF Regulation 3.027).
5. **Exceptions:** If there are specific assignments where the use of AI tools is not appropriate, these will be clearly marked in the assignment guidelines. Students must adhere to these specific instructions.
6. **Questions and Clarifications:** If students are unsure whether a tool they wish to use qualifies as a generative AI tool, or if they have questions regarding the allowable use of such tools, they should consult with the course instructor before using it.

Religious Observances

Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) to the instructor, in writing by the second class meeting.

Special Needs

Students with disabilities are encouraged to consult the instructor as soon as possible each term. If accommodations are needed, a letter from the Office of Student Disability Services (SVS 1133, Tampa Campus) will be required. Please inform both instructors if there is a need for an alternate format for documents or a note-taker. Additional information about these matters can be obtained from <http://www.sds.usf.edu/> or by calling 813.974-4309 or sending a facsimile to 813.974-7337.

Emergency Preparedness

In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Canvas, Blackboard Ultra, Skype, and email messaging and/or an alternate schedule. It's the responsibility of the student to monitor Canvas site for each class for course specific communication, and the main USF, College, and department websites, emails, and MoBull messages for important general information.

Course Schedule

This course will address the following topics presented in the following modules. Changes to the schedule may occur if necessary, so watch the course website for the most up-to-date schedule.

Module 1: Overview and Descriptive Statistics

Measures of central tendency, measures of dispersion, stem-and-leaf diagrams, frequency distributions and histograms, Pareto charts, box plots, and time series plots

Module 2: Building the Foundation of Probability

Basic principles, properties of probability, probability counting, permutations, combinations, conditional probability and independence.

Module 3: Discrete Random Variables

Uniform distribution, binomial distribution, Poisson distribution

Module 4: Continuous Random Variables

Normal distribution, central limit theorem, exponential distribution, and probability plots

Module 5: Statistical Intervals for a Single Sample

Confidence interval properties, confidence intervals for mean and variance

Module 6: Test of Hypotheses for a Single Sample

Hypothesis testing-single sample, p-value, Type I and Type II error

Module 7: Linear Regression

Estimating model parameters, inferences about the slope parameter, correlation, nonlinear models

Textbook and References

Required text:

Devore, Jay. L. 2016. *Probability and Statistics for Engineering and the Sciences*, 9th Edition. Boston, MA: Brooks/Cole CENGAGE Learning.

Additional material will be posted to the course website as needed. Other interesting statistics related references include:

- Hooke, Robert. 1983. *How to Tell the Liars from the Statisticians*. New York, New York: Marcel Dekker, Incorporated.
- Huff, Darrell. 1954. *How to Lie with Statistics*. New York, New York: W. W. Norton & Company.
- Salsburg, David. 2001. *The Lady Tasting Tea: How Statistics Revolutionized Science in the Twentieth Century*, 2nd Edition. New York, New York: W. H. Freeman and Company.

Course Website

The course has a web site in the USF Portal. You can access the course web site at <https://learn.usf.edu>. You will need a USF NetID and password in order to have access. If you do not already have a USF NetID, you can obtain one by going to <https://netid.usf.edu>. Procedure to log onto the website:

1. Go to <https://learn.usf.edu>
2. Log into Canvas using your USF NetID and password.
3. Click on the Courses tab, and then click on the course title.
4. Look for course information by clicking on the buttons: Announcements, Syllabus, Faculty Information, Course Material, Assignments, Books, Communication, Virtual Classroom, Discussion Board, Groups, Web Sites, and Tools.

Check this website frequently for: course syllabus updates, posted notices of importance, additional resources. If you have any limitation on your access to the course website, it is your responsibility to communicate with both instructors to obtain access to course materials to keep up with course work.

Accommodation

We expect students to use office hours to their advantage; however, we also make every effort to accommodate special needs if such accommodation is requested in a responsible and respectful manner.

We will deliver this class, as scheduled, in-person and will provide a flexible component for students who are asked to isolate or quarantine, or are unable to attend a class in-person for an extended period of time. Please note: All students may be required to attend in-person classes, especially to complete assessments and examinations. For students planning to attend in-person, we will teach in-person classes in the assigned classroom and on the scheduled day and time. For students who are unable to attend a class in-person, we will provide course content in a flexible format to support the student's academic progression and success. Please contact me directly if you have questions. In addition, we will post details on how a student can join the class remotely in Canvas.

Feedback

We value feedback highly, so please feel comfortable approaching or emailing us with your suggestions, questions, and criticisms. We will use the feedback to make adjustments in order to accommodate the needs of students in this class while also using the feedback toward continuous improvement of the course and our teaching. We will ask for structured anonymous feedback three times during the course, but do not wait until then to approach us. Please, feel free to approach us any time. We appreciate your thoughts.

Tentative Class Schedule Fall 2024 Section 002

Week	Tuesday 11:00am - 12:15pm	Thursday 11:00am - 12:15pm	Friday 9:30am - 10:20am
1	Aug. 27	Aug. 29	Aug. 30
	Course Introduction + Ch. 1	Ch. 1	IDL Start Up Module Workshop 1
2	Sept. 3	Sept. 5	Sept. 6
	Ch. 1 + Ch. 2	Ch. 2	Recitation Session #1
3	Sept. 10	Sept. 12	Sept. 13
	Ch. 2	Ch. 3	Quiz #1 (Ch. 1 + Ch. 2)
4	Sept. 17	Sept. 19	Sept. 20
	IDL 1 Data Visualization + Workshop 2	Ch. 3	Recitation Session #2
5	Sept. 24	Sept. 26	Sept. 27
	Ch. 3	Ch. 3 /Ch. 4 + IDL 1 Argument	Recitation Session #3
6	Oct. 1	Oct. 3	Oct. 4
	Ch. 4	Ch. 4	Quiz #2 (Ch. 3 + Ch. 4)
7	Oct. 8	Oct. 10	Oct. 11
	Ch. 4	Midterm Review	Workshop 3
8	Oct. 15	Oct. 17	Oct. 18
	Midterm Exam (Ch1+Ch2+Ch3+Ch4)	Ch. 7	Recitation Session #4
9	Oct. 22	Oct. 24	Oct. 25
	IDL 2 Data Visualization + Workshop 4	Ch. 7	Quiz #3 (Ch. 7)
10	Oct. 29	Oct. 31	Nov. 1
	Ch. 7 + Ch8 + IDL 2 Argument	Ch. 8	Workshop 5
11	Nov. 5	Nov. 7	Nov. 8
	Ch 8	Ch. 8	Recitation Session #5
12	Nov. 12	Nov. 14	Nov. 15
	IDL 3 part 1 + Workshop 6	Ch 12	Recitation Session #6
13	Nov. 19	Nov. 21	Nov. 22
	Ch. 12	Ch. 12	Quiz #4 (Ch. 8 + Ch. 12)
14	Nov. 26	Nov. 28	Nov. 29
	Ch12 + IDL 3 part 2	Thanksgiving Day Holiday	Thanksgiving Day Holiday
15	Dec. 3	Dec. 5	Dec. 6
	Final Exam Review	Final Exam Review	Office Hour
16	Dec. 8		
	2-hour Comprehensive Final Exam: 5:30 pm – 7:30 pm		

Ch. 1 – Descriptive statistics

Ch. 2 – Probability

Ch. 3 – Discrete Random Variables

Ch. 4 – Continuous Random Variables

Ch. 7 – Statistical Intervals

Ch. 8 – Hypothesis Testing

Ch. 12 – Linear Regression