

**BENG 100. Introduction to Probability and Statistics for Bioengineers**  
**Course Syllabus**

**Instructor:** Alyssa Taylor, Ph.D.  
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**Office Hours:** After lecture session on Mondays

**Prerequisites**

BENG 1; MATH 18 or MATH 31AH or MATH 20F; MATH 20C or MATH 31BH; or consent of the department.

**Course Description**

The class provides foundation in probability and statistics. Topics include probability spaces, random variables, independence, common distributions, CLT, estimator accuracy, maximum likelihood, and hypothesis testing. Written problems are provided for each topic. Applications are discussed in regard to bioengineering problems.

**Textbook and Other Materials**

**Required Reading**

*Introduction to Probability, Statistics, and Random Processes*, Hossein Pishro-Nik, Kappa Research, LLC. August 24, 2014. ISBN-10: 0990637204. ISBN-13: 978-0990637202.

Please note that the textbook is also freely available online: <https://www.probabilitycourse.com/>

**Additional Materials**

In addition to the textbook listed above, and the detailed notes we will provide for your reference, there is a plethora of available information on the Internet. This information includes peer-reviewed manuscripts, Wikipedia articles, YouTube videos of lectures from UC San Diego and/or other universities, and much more. Students are encouraged to review additional online materials to supplement discussion in class.

**Course Learning Outcomes**

After successfully completing this class, a student will be able to:

- a. Understand basic concepts of set theory, probability theory, and statistics
- b. Understand probability measure and conditional probability
- c. Describe the properties of discrete and continuous distribution functions
- d. Assess the consistency, efficiency and unbiasedness of estimators
- e. Apply methods of maximum likelihood estimation
- f. Understand and apply the Central Limit Theorem (CLT)
- g. Understand and use classical and Bayesian statistical tests and inference

**Welcome to Class, and a Note on Inclusion:** Welcome to BENG 100, and I am excited to have the opportunity to get to know you. It is my intention that students from all backgrounds and perspectives will be well-served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations,

sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

### **Accommodations for Students Due to a Disability:**

I am committed to ensuring access to classes, course material, and learning opportunities for students with disabilities. Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD) which is located in University Center 202 behind Center Hall. Students are required to present their AFA letters to Faculty (please make arrangements to contact me privately, I am very happy to discuss!) and to the OSD Liaison in the department in advance so that accommodations may be arranged. Contact the OSD for further information: 858.534.4382 (phone), [osd@ucsd.edu](mailto:osd@ucsd.edu) (email), or <http://disabilities.ucsd.edu> (website). Students with accommodations will utilize the Triton Testing Center to take tests for this class.

### **Religious Accommodation: See: [EPC Policies on Religious Accommodation, Final Exams, Midterm Exams](#)**

It is the policy of the university to make reasonable efforts to accommodate students having bona fide religious conflicts with scheduled examinations by providing alternative times or methods to take such examinations. If a student anticipates that a scheduled examination will occur at a time at which his or her religious beliefs prohibit participation in the examination, the student must submit to the instructor a statement describing the nature of the religious conflict and specifying the days and times of conflict. In senior design, we do not hold examinations, but I wanted you to have this information.

### **Class Schedule**

Students are expected to attend all lectures in person. However, attendance will not be used as part of the grade. A detailed schedule of lectures, homework assignments, and exams is provided in a separate document posted on Canvas.

### **Lectures**

Mondays	10 – 10:50 am	Warren Lecture Hall Room 2207
Wednesdays		
Fridays		

### **Discussion Sections**

The lectures and notes are structured to follow the main textbook *Introduction to Probability, Statistics, and Random Processes* by Hossein Pishro-Nik. Please refer to the Detailed Class Schedule document on Canvas. Each lecture will be conducted in person. While the lectures will predominately focus on theory, the discussion sections will be focused on solving problems. Each book chapter as well as most subchapters contain a number of solved problems. We will go over these solved problems during discussion section. Please make sure that you review the solved problems for the appropriate chapter section(s) prior to attending the discussion sections. The pace is so fast during the quarter system, that this will be important practice and application time for you.

Day	Time	Location
Wednesday	9 - 9:50 am	CENTR 222

**Exams**

Exam	Date	Time	Location
Midterm Exam	25 Oct	11 am – 11:50 pm	WLH 2207
Midterm Exam	20 Nov	11 am – 11:50 pm	WLH 2207
Final Exam	15 Dec	8:00 am – 10:59 am	TBA by UCSD (will be in person)

**Homework Assignments-** see detailed schedule for due dates. Assignments are due by 11 pm on their due date unless otherwise announced. We aim to post solutions within 24 – 48 hours of the due date.

All dates and times are in Pacific Time (San Diego local time).

**Methods of Evaluation**

The final class grade will be based on the *maximum* from the following two grading options:

**Class Grade: Option 1**

- Homework assignments (24%; six homework assignments, each 4%)
- Midterm exams (2) (36% total)
- Final exam (40%)

Any missed homework assignment or midterm exam will increase the weight of the final exam. For example, if a student does not submit homework assignment 1 (4% of the class grade), the final exam will increase with 4% of the total grade (*i.e.*, from 40% to 44% of the class grade).

**Class Grade: Option 2**

- Final exam (100%)

All students are encouraged to submit all homework assignments and to take the midterm exam, *i.e.*, option 1. In principle, option 2 should be regarded as a safety option that allows receiving a higher grade even if the student's performance throughout the quarter was suboptimal.

**Final Grades**

The final class grade will be based on the maximum of option 1 and option 2. For example, if a student has 89% from all combined assignments (option 1) and 96% on the final exam (option 2), the student will receive the higher grade of 96%. The letter grade for the class will be based on the final class grade, *i.e.*, the maximum of options 1 and 2. The table below provides the anticipated minimum scores required for different grades. The default grade is a letter grade. If you're interested in choosing a P/NP option, you should consult with an advisor to make sure you understand the details of choosing that grading option.

Letter Grade	Score	P/NP	S/U
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<b>A+</b>	95	<b>Pass</b>	<b>Satisfactory</b>
<b>A</b>	90		
<b>A-</b>	85		
<b>B+</b>	80		
<b>B</b>	75		
<b>B-</b>	70		
<b>C+</b>	65		
<b>C</b>	60	<b>No Pass</b>	<b>Unsatisfactory</b>
<b>C-</b>	55		
<b>D</b>	50		
<b>F</b>	0		

### Class Policies

- Homework assignments must be written clearly and neatly. Illegible homework will not be graded. Homework assignments may be discussed in groups but must be worked individually and not copied. The homework assignments are to be submitted via Gradescope as PDF files. No late homework will be accepted or graded. Due dates are firm and exceptions cannot be made. Grading policies in this class account for the fact that illness, emergencies can and will happen. I suggest planning to submit well ahead of the cutoff, to avoid any logistical challenges.
- A solution to each homework assignment will be provided on Canvas within 24-48 hours after the homework assignment is due.
- All submissions of homework assignments must be done through Gradescope and no paper submissions will be accepted. Submissions of homework assignments need to follow the submission guidelines (provided in a separate document). Importantly, if a Gradescope submission lacks page numbers for a given problem, the student will receive 0 points for that problem even if the problem has been included in their original submission.
- In fairness to all students, work will only be re-graded when there is evidence of a grading error. We reserve the right to re-grade an entire piece of work, which may result in an overall grade that is lower or higher. The deadline for re-grade requests is within 48 hours from the date grades are posted on Canvas. Please note that partial credit given for any unsolved problem will not be changed.
- If a student does not take/submit a midterm exam or does not submit a homework assignment, the final exam will be weighed more heavily. Students that have an emergency, miss any midterm exam and would like to take a make-up exam may utilize a limited make-up window (2 days post midterm) and take the make-up exam by scheduling their time with the Triton Testing Center at [tritontesting.ucsd.edu](http://tritontesting.ucsd.edu).

- A final exam taken other than at the regularly scheduled date/time will be an oral exam coordinated with the instructor that includes solving problems in real time. Further, per University policy, a final exam taken other than at the regularly scheduled date/time will be allowed only in exceptional circumstances.
- Each student will need to bring to a midterm exam a blue book and a maximum of one single-sided letter size notes/cheat/reference sheet (11in x 8.5in). The use of any digital device (calculator, laptop, tablet, phone, *etc.*) during a midterm exam is not allowed. Further, the use of textbooks or written materials other than the cheat sheet is not allowed. If a student is caught using a digital device, a textbook, or materials other than the ones that are allowed during a midterm exam, the student will be asked to leave the midterm exam and the student will receive an exam score of zero.
- Each student will need to bring to the final exam a blue book and a maximum of one double-sided letter size cheat sheet (11in x 8.5in). The use of any digital device (calculator, laptop, tablet, phone, *etc.*) during a midterm exam is not allowed. Further, the use of textbooks or written materials other than the cheat sheet is not allowed. If a student is caught using a digital device, a textbook, or materials other than the ones that are allowed during the final exam, the student will be asked to leave the final exam and the student will receive a final exam score of zero. Since the final exam accounts for a significant proportion of the final grade, a student with a score of zero on the final exam will most likely fail the class.
- **Academic Integrity:** You are all college students and professional, and recognize the importance of acting with academic integrity so I don't anticipate any problems but... the Shu Chien-Gene Lay Department of Bioengineering adheres to the UCSD Policy on Integrity of Scholarship and we expect all students to honor this policy. An excerpt of this Policy states that "Students are expected to complete the course in compliance with the instructor's standards. No student shall engage in any activity that involves attempting to receive a grade by means other than honest effort...." Any suspected incident of academic integrity violation will be dealt with in accordance with UCSD policy. According to UCSD policy, consulting any unauthorized material that contains answers to any assignment is academic dishonesty. Any suspected incident will be dealt with in accordance with UCSD policy, including reporting the misconduct to the Dean of Student Affairs and the Academic Integrity Office. More information on UCSD's Policy on Integrity of Scholarship can be found at: <https://academicintegrity.ucsd.edu/process/policy.html>

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