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

Instructor: Ludmil B. Alexandrov, Ph.D.
Email: L2alexandrov@health.ucsd.edu
Office: Zoom; https://ucsd.zoom.us/j/96085613972
Office Hours: Wednesday, 12:00pm – 1:00pm

TAs/emails: Heera Bajpe, hbajpe@ucsd.edu
Shashank Bansal, shbansal@ucsd.edu
Krishna Brunton, kbrunton@ucsd.edu
Bryce Henroid, bhenroid@ucsd.edu
Darya Verska, dveraksa@ucsd.edu

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, 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 strongly encouraged to review additional online materials prior to each lecture.

Course 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

Class Schedule
Students are expected to attend all lectures in person. However, attendance will not be used as part of the grade. Due to space regulations, students should only attend their assigned discussion section each

week. A detailed schedule of lectures, homework assignments, and exams is provided in an additional document posted on Canvas.

Lectures

Tuesdays	2:00pm – 3:20pm	CENTR 109
Thursdays	2:00pm – 3:20pm	CENTR 109

Discussion Sections

The lectures and notes are structured to follow the main textbook *Introduction to Probability, Statistics, and Random Processes* by Hossein Pishro-Nik. During each week, the lectures will cover approximately one chapter in the book (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. Teaching assistants will walk you through and explain these solved problems during the discussion sections. Please make sure that you review the solved problems for the appropriate chapter section(s) prior to attending any of the discussion sections. The schedule for discussion sections is provided below.

Day	Time	Teaching Assistant	Location
Monday	3:00pm – 3:50pm	Darya Verska	CENTR 203
Monday	4:00pm – 4:50pm	Shashank Bansal	CENTR 203
Friday	11:00am – 11:50am	Krishna Brunton	WLH 2206
Friday	12:00pm – 12:50pm	Bryce Henroid	WLH 2206
Friday	1:00pm – 1:50pm	Heera Bajpe	CENTR 203

Exams

Exam	Date	Time	Location
Midterm Exam 1	30 April	2:00pm – 3:20pm	CENTR 109
Midterm Exam 2	23 May	2:00pm – 3:20pm	CENTR 109
Final Exam	11 June	3:00pm – 5:59pm	TBD

Homework Assignments

Assignment	Date and Time Posted	Date and Time Due	Date and Time Solutions Posted
Homework Assignment 1	2 April, 7:00pm	9 April, 11:00pm	10 April, 9:00pm
Homework Assignment 2	9 April, 7:00pm	16 April, 11:00pm	17 April, 9:00pm
Homework Assignment 3	16 April, 7:00pm	23 April, 11:00pm	24 April, 9:00pm
Homework Assignment 4	2 May, 7:00pm	9 May, 11:00pm	10 May, 9:00pm
Homework Assignment 5	9 May, 7:00pm	16 May, 11:00pm	17 May, 9:00pm
Homework Assignment 6	28 May, 7:00pm	4 June, 11:00pm	5 June, 9:00pm

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 at 4%)
Midterm exams (36%; two midterm exams each at 18%)
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 exams, *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, P/NP grade (undergraduate students only), or S/U grade (graduate students only) 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 minimum scores required for different grades. The default grade is a letter grade, and you can change it to P/NP grade or S/U grade.

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

- A solution to each homework assignment will be provided on Canvas within 24 hours after the homework assignment is due. Similarly, a solution to each exam will be provided on Canvas within 24 hours after the exam's due date and time.

- All homework assignments will be graded within a week of the due date. Similarly, both midterm exams will be graded within a week of completion of the exams. The final exam will be graded by 17-June. All grades will be posted on Canvas.

- 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). <u>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.</u>

- 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 <u>within 48 hours from the date grades are posted on Canvas</u>. Please note that partial credit given for any unsolved problem will not be changed.

- If a student does not take a midterm exam or does not submit a homework assignment, the final exam will be weighed more heavily. A final exam taken other than at the regularly scheduled date/time will be an oral exam 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 <u>allowed only in exceptional circumstances</u>.

- Each student will need to bring to a midterm exam a blue book and a maximum of <u>one **single-sided**</u> 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 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 <u>one **double-sided**</u> 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 dishonesty will not be tolerated. According to UCSD policy, <u>consulting any unauthorized material that contains answers to any assignment</u> 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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