CALIFORNIA STATE UNIVERSITY, LONG BEACH
Department of Electrical Engineering

EE381: Probability and Statistics with Applications to Computing

(Prepared by: Jun Zhou, Instructor)

1. Catalog Data:

Course No. & Title:	**EE 381: Probability and Statistics with Applications to Computing**
Course Credit:	3 semester units
Mode of Instruction:	Lecture 2 hours – Laboratory 3 hours per week
Lectures:	Friday 5:00 PM – 6:50 PM online
Lab:	Friday 7:00 PM – 9:45 PM online
Office Hour:	Saturday 8:00 AM – 9:00 AM (or with appointment)
Grading:	Traditional "Letter Grades" (Grade Points: A=4, B=3, C=2 and D=1)
Prerequisites:	CECS 229

2. Course Instructor:

Dr. Jun Zhou, Lecturer
Dr. Anastasios Chassiakos, Course coordinator

3. Course Objectives:

The course introduces students to concepts of probability theory with an emphasis on computer modeling of probabilistic systems. Topics include random variables and their statistics, probability distributions, Markov chains, Bayesian networks, sampling techniques, hypothesis testing, regression and analytic methods. The concepts are presented from a mathematical foundation, developed and exemplified with realistic computer simulations using Python.

4. Selected Course Topics:

1. Probability concepts and theorems, conditional probability, Bayes' rule.
2. Discrete random variables, probability distributions
3. Continuous random variables, probability distributions
4. Sampling Theory, sample statistics and distributions.
5. Estimation theory, confidence intervals
6. Hypothesis testing
7. Markov chains

5. Textbooks:

1. [Required] Spiegel, Schiller and Srinivasan, *Probabilty and Statistics*, 4th edition, McGraw-Hill / Schaum's, 2012. ISBN: 987-0-07-179557-9.
2. [Optional] Roy D. Yates, David J. Goodman, *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*, 3rd Edition, Wiley, 2014, ISBN-13: 978-1118324561
3. [Optional] John Gubner, *Probability and Random Processes for Electrical and Computer Engineers*, Cambridge, 2006, ISBN: 9780521864701

6. Grading:

Direct assessment is used to evaluate the students have acquired understanding of the fundamental concept of probability and statistical methods. Homework needs to be completed independently. Comprehensive lab assignments are used to evaluate the students have acquired the methodologies of formulating and solving complex probability and statistical problems. Students use Python to generate signal files, process and analyze data as specified in each task. Students can work together in lab session. But each student is required to complete lab report independently. Late submission of homework and lab report will receive penalty.

Evaluation :

Homework	..20%
Midterm and Final	50%
Lab Projects	30%
Total:	100%

7. Schedule :

Week	Due Date	Topics, Readings, Assignments
1	1/24	**Basic concepts of probability (Ch.1):** Discrete sample spaces, counting method, important theorems on probability
2	1/31	**Basic concepts of probability (Ch.1):** Conditional probability, independence, Bayes' rule
3	2/7	**Basic concepts of probability (Ch.1):** Combinatorial analysis
4	2/14	**Discrete random variables (Ch. 2):** Discrete probability distributions, joint distributions
5	2/21	**Discrete random variables (Ch. 3):** Mathematical expectation, variance, standardized random variables, covariance and correlation
6	2/28	**Discrete random variables (Ch. 4):** Binomial distribution, Bernoulli trials, multinomial distribution, hypergeometric distribution
7	3/6	**Continuous random variables (Ch. 2 & Ch. 3):** Probability distribution, expectation, variance, covariance and correlation
8	3/13	**Midterm**
9	3/20	**Continuous random variables (Ch. 4):** Uniform distribution, normal distribution, other distribution, central limit theorem
10	3/27	**Sampling theory (Ch. 5):** Sample statistics, sampling distributions for the mean
11	4/10	**Estimation theory (Ch. 6):** Unbiased estimates / efficient estimates, confidence intervals
12	4/17	**Hypothesis testing (Ch. 7):** Statistical decisions, tests of hypothesis and significance
13	4/24	**Markov chains**
14	5/1	**Markov chains**
15	5/8	**Markov chains (optional)**
16	5/15	**Final exam**

8. Course Structure and Delivery Mode

This course is conducted entirely online. You will access the course material and activities on BeachBoard and are required to participate in synchronous class meetings via Zoom. If you need technical assistance at any time during the course or need to report a problem with BeachBoard, please contact the Technology Help Desk by phone at (562) 985-4959.

9. Course Communication

We use BeachBoard to make announcements, communicate information, post assignments and corresponding due dates, and discuss course-related topics. **It is your responsibility** to check BeachBoard's dashboard regularly, as it will contain important information about upcoming class assignments, activities, or concerns.

Additional Resources

- **Plagiarism/Academic Integrity Policy**

There is **zero tolerance** for cheating, plagiarism, or any other act of violation of Academic Integrity policy. Work that you submit is assumed to be original unless your source material is documented appropriately, using proper citation. Using the ideas or words of another person, even a peer, or a web site, as if it were your own, is plagiarism. Any individual or group caught cheating on homework, lab assignments, or any exam/quiz will be subjected to full extent of academic actions allowed under University regulations. At a minimum, any student caught violating Academic Integrity Policy will receive no credit for the work concerned and one grade lower letter grade. To learn more about the University policy on Cheating and Plagiarism, visit:

Academic Information and Regulations-Cheating and Plagiarism

- **Attendance and Participation Policy**

Attendance (joining the online class) and Participation (being alert and available if inquired by the instructor in contrast to being just online but unresponsive) are essential to your success in this class. In distance education courses you are required to attend and participate just as if you were in a face-to-face course. Therefore, attendance will be taken every session and the participation will be checked randomly during class, lab or both. **Three or more unexcused absences during the class will cause -5% of the total grade.**

- **Special Needs Accommodations**

Online courses are required to meet ADA accessibility guidelines. Students with a disability or medical restriction who are requesting a classroom accommodation should contact the Bob Murphy Access Center (BMAC) and also notify the instructor. BMAC personnel will work with the student to identify a reasonable accommodation in partnership with appropriate academic offices and medical providers. Only approved BMAC petitions will be accommodated.

Any student who is facing academic or personal challenges due to difficulty in affording groceries/food and/or lacking a safe and stable living environment is urged to contact the CSULB Student Emergency Intervention & Wellness Program. Additional resources are available via Basic Needs Program. The students can also email supportingstudents@csulb.edu, call (562)985-2038, or if comfortable, reach out to the instructors as they may be able to identify additional resources. For mental health assistance please check out CSULB Counseling and Psychological Services (CAPS).

http://web.csulb.edu/divisions/students/caps/

- **COE Student Success Center**

Three Student Success Centers

- The **Graduate Student Success Center (VEC-128A)**, where graduate students can get information on admission, graduation, OPT/CPT, and more;
- The **Writing and Communication Resource Center (VEC-128B)**, a place for undergraduates to get help with their Writing Intensive Capstone classes and for graduate students to get help with thesis formatting and writing; and
- The **Dudley Library (EN2-109)**, our own COE branch of the campus library available for literature searches and research resources.

Stop by and meet the directors of these new facilities, including:

Dr. Antonella Sciortino, coordinator of the Graduate Student Success Center;
Dr. Maryam Qudrat, coordinator of the Writing and Communication Resource Center, and
Ms. Hema Ramachandran, CSULB's Engineering Librarian.

- **COE Tutoring Services Available for Major Classes**

The College of Engineering Tutoring Center offers free tutoring for many lower and upper division engineering courses in MAE, CECS, CECEM, CHE and EE. Tutors are available Monday through Friday during the fall and spring semesters between the hours of 9:00am-6:00pm in EN2-300.

Visit the following website for detailed tutoring schedules:
http://web.csulb.edu/colleges/coe/views/essc/academic_success/engineering_tutor.shtml#asp_ETP