

CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

STAT 350 – Probability and Random Processes for Engineers

Fall 2015

1. Catalog Description

STAT 350 Probability and Random Processes for Engineers (4 units) GE B6

Random events, random variables, and random processes, with emphasis on probabilistic treatment of signals and noise. Specific topics include: sample spaces, probability, distributions, independence, moments, covariance, time/ensemble averages, stationarity, common processes, correlation and spectral functions. 4 lectures.
Prerequisite: MATH 241, EE 228. Fulfills GE B6.

2. Required Background and/or Experience

MATH 241, EE 228.

3. Expected Outcomes

The student should be able to:

- a. Demonstrate an understanding, both conceptually and mathematically, of probability, random events, random variables, and random processes.
- b. Calculate probabilities, conditional probabilities, expected values, etc., for random events, random variables, and random processes by utilizing a variety of mathematical tools and methods.
- c. Define and use various kinds of random variables and processes commonly encountered in electrical engineering.

4. Text and References

Possible Texts: Yates, R., Goodman, D., *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*, 3rd ed., Wiley, 2014.

Carlton, M., Devore, J., *Probability with Applications in Engineering, Science, and Technology*, Springer, 2014.

References: Peebles, P., *Probability, Random Variables and Random Signal Principles*, 4th ed., McGraw-Hill, 2001.

Leon-Garcia, A., *Probability, Statistics, and Random Processes for Electrical Engineering*, 3rd ed., Pearson Prentice Hall, 2008.

5. Minimum Student Materials Required

Text, paper, pencils and pocket calculator.

6. Minimum University Facilities Required

Classrooms with chalkboards, audiovisual equipment, and computer access.

7. **Expanded Description of Content and Method of Instruction**

CONTENT	HOURS OF LECTURES
A. Random events	6
1. Sample space, random events, probability	
2. Joint and conditional probabilities, Bayes' rule	
3. Statistically independent events	
B. Random variables	16
1. Discrete versus continuous random variables	
2. Probability mass function, probability density function	
3. Cumulative distribution function	
4. Expectation, moments, mean, variance, standard deviation	
5. Jointly distributed random variables	
6. Independent random variables	
7. Uncorrelated and orthogonal random variables	
8. Common distributions, including binomial, Poisson, uniform, (joint) Gaussian	
9. Central limit theorem	
C. Random processes	14
1. Discrete- and continuous-time random processes	
2. Time versus ensemble averages	
3. Stationarity, ergodicity	
4. Second-order properties, wide-sense stationarity	
5. Uncorrelated and orthogonal random processes	
6. Autocorrelation, power spectral density	
7. Cross-correlation, cross-power spectral density	
8. Common processes, including Poisson process, Gaussian process	
9. Linear filtering of a random process	
10. White noise	
Total	<u>36</u>

METHOD OF INSTRUCTION

- A. Lecture/discussion and activity
- B. Readings in the text and other assigned material
- C. Appropriate homework assignments

8. **Method of Evaluating Outcome**

Problem assignments, scheduled tests, and a final examination.