CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

STAT 305 – Introduction to Probability and Simulation **Fall 2017**

1. Catalog Description

STAT 305 Introduction to Probability and Simulation (4)
Basic probability rules, counting methods, conditional probability. Discrete and continuous random variables, expected values, variance and covariance. Properties of linear combinations of random variables with applications to statistical estimators. Simulation analysis of random phenomena using a modern computer language. Not open to students with credit in STAT 321. 4 lectures. Prerequisite: CPE/CSC 101, CSC 232, CPE/CSC 235, or STAT 331; and MATH 142.

2. Required Background and/or Experience

CPE/CSC 101, CSC 232, CPE/CSC 235, or STAT 331; and MATH 142

3. Expected Outcomes

The student should be able to:

a. use definitions, rules, and counting methods to solve probability problems;
b. calculate probabilities, expected values, and variances related to discrete and continuous random variables;
c. identify and apply probability distributions to solve probability problems;
d. apply properties of expected values and variances to linear combinations of random variables; and
e. simulate random phenomena to approximate probabilities, expected values, and distributions of random variables

4. Text and References

Text: Carlton, M., Devore, J., *Probability with Applications in Engineering, Science, and Technology,* 1st ed., Springer, 2015.

References: Higgins, J., Keller-McNulty, S., *Concepts in Probability and Stochastic Modeling*, 1st ed., Duxbury, 1995.

5. Minimum Student Materials

Calculator and access to Matlab, R, or equivalent software for student use in preparing assignments and taking exams.

6. Minimum University Facilities

Access to Matlab, R, or equivalent software in the classroom, data projection capability, and chalkboard for instructional use.

7. Expanded Description of Content and Method

Content: *Number of Lectures*

1) Probability rules 3

Sample space, event, probability axioms, equally likely events, complement rule, addition rule

2) Simulation 3

Random process, simulation, loops, conditional statements

3) Counting methods 2

Permutations, combinations

4) Conditional probability 6

Conditional probability, tree diagrams, probability tables, multiplication rule, independent events, law of total probability, Bayes' rule

5) Discrete and continuous random variables 14

Probability mass function, continuous random variable, probability density function, cumulative distribution functions; expected value, variance, standard deviation; binomial, Poisson, uniform, normal, exponential distributions

6) Linear combinations of random variables 8

Mean and standard deviation, covariance, Central Limit Theorem, applications of C.L.T.

Total 36

8. Method of Evaluating Outcome

Daily problem assignments, computer-based projects, scheduled tests, and a final examination.