CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

STAT 426 – Estimation and Sampling Theory **Fall 2015**

1. Catalog Description

STAT 426 Estimation and Sampling Theory (4)

Continuation of STAT 425. Properties of statistics obtained from samples. Sample mean properties, convergence in probability, law of large numbers, and central limit theorem. Selected probability distributions. Theory of estimation. Sampling distribution of estimators.

2. Required Background and/or Experience

STAT 425. Recommended: STAT 302.

3. Expected Outcomes

The student should be able to:

a. apply, when appropriate, a variety of probability distributions: binomial, Poisson, geometric, negative-binomial, normal, beta, gamma and others;
b. use moment generating functions in general and specifically with those related to the distributions above;
c. apply and prove properties of the distributions above;
d. derive and explain the Law of Large Numbers and the Central Limit Theorem;
e. understand and be able to apply principles of estimation theory, including unbiasedness, consistency, variance, and mean squared error;
f. understand Bayesian and maximum likelihood estimation techniques;
g. understand the concept of a sampling distribution; and
h. be able to construct and interpret confidence intervals.

4. Text and References

Text: DeGroot, M.H. and Schervish, M.J., *Probability and Statistics*, 4th ed., Pearson, 2012.

References: Larsen and Marx, *An Introduction to Mathematical Statistics and its Applications,* 5th ed., Pearson, 2012.

Hogg, McKean, and Craig, *Introduction to Mathematical Statistics*, 7th ed., Pearson, 2013.

5. Minimum Student Materials

Hand calculator. Occasional access to statistical software.

6. Minimum University Facilities

Chalkboards and computer projectors for class use. Access to statistical software.

7. Expanded Description of Content and Method

Content:		*Number of Lectures*
A.	**Theoretical and Sample Means**	**6**
	1. Markov and Chebyshev's Inequality	
	2. Moment Generating Functions	
	3. Properties of the Sample Mean	
	4. Convergence in Probability	
	5. Law of Large Numbers	
B.	**Selected Probability Distributions**	**8**
	1. Binomial, geometric, and negative binomial	
	2. Poisson	
	3. Exponential, gamma, and beta	
	4. Univariate normal	
	5. Central Limit Theorem	
	6. Multinomial	
	7. Bivariate Normal	
C.	**Estimation**	**10**
	1. Bayesian Estimation	
	2. Maximum Likelihood	
	3. Sufficiency and Jointly Sufficient Statistics	
	4. Rao-Blackwell Theorem	
D.	**Sampling Distributions of Estimators**	**8**
	1. The Sampling Distribution of a Statistic	
	2. The Chi-square Distribution	
	3. Joint Distribution of x-bar and s	
	4. The t distribution	
	5. Confidence Intervals	
	6. Unbiased Estimators	
	Total	36

8. Method of Evaluating Outcome

Problem assignments, scheduled tests, and final examination.