Stat 122 (Mathematical Statistics 2)

Course Outline

Course Information

Course Code: Stat 122

Course Title: Mathematical Statistics 2

Pre-requisite: Stat 121 (Mathematical Statistics 1)

Credit: 3.0 units

Semester Offered: Second Semester

Number of Contact Hours per Week: 3 hours lecture per week (10-11:30 TF)

Course Description: Functions of random variables, sampling distributions, point and interval estimation

Course Outcomes

1. Derive distributions of functions of random variables;
2. Derive sampling distributions related to the normal distribution;
3. Derive point and interval estimates of population parameters; and
4. Evaluate properties of point estimators.

Topical Outline

Module 1. Distribution of Functions of Random Variables

1. The Cumulative Distribution Function Technique
2. The Transformation Technique
3. The Moment Generating Function Technique
4. Bivariate Transformation
5. Distribution of Order Statistics

Module 2. Sampling Distributions and the Central Limit Theorem

1. Sampling distributions related to the normal distribution (chi-square, t, and F distributions)
2. The Central Limit Theorem
3. The normal approximation to the binomial distribution

Module 3: Point and Interval Estimation

1. Bias and mean square error
2. The standard error of an estimator
3. Estimating the population variance
4. Error bounds and the empirical rule
5. Confidence intervals and pivotal quantities
6. Large-sample confidence intervals
7. Sample size determination
8. Small-sample confidence intervals for normal means
9. Confidence intervals for variances

Module 4. Properties of Point Estimators and Methods of Estimation

1. Sufficiency
2. The Rao-Blackwell theorem
3. Method of moments estimation
4. Maximum likelihood estimation
5. Consistency and the Weak Law of Large Numbers
6. Large-sample properties of maximum likelihood estimators

Course Requirements and Grading System

1. Quizzes (15%)
2. Problem Sets (25%)
3. Long Examinations (60%)

Rating (%)	Grade Equivalent
98-100	1.00
95-97	1.25
90-94	1.50
85-89	1.75
80-84	2.00
75-79	2.25
70-74	2.50
65-69	2.75
60-64	3.00
53-59	3.25
46-52	3.50
39-45	3.75
32-38	4.00
25-31	4.25
18-24	4.50
11-17	4.75
0-10	5.00

Suggested References

1. Mendenhall, W., Scheaffer, R. L., and Wackerly, D. D. (2008). Mathematical Statistics with Applications, 7th ed. Brooks/Cole, Cenage Learning.
2. Hogg, R. V., Tanis, E. A., and Zimmerman, D. L. (2015). Probability and Statistical Inference, 9th ed. Pearson Education, Inc.

3. Hogg, R.V. and Craig, A. T. (2004). Introduction to Mathematical Statistics, Fifth Edition, Macmillan Publishing Co., Inc., N.Y.

4. Ramachandran, K. M. and Tsokos, C. P. (2009). Mathematical Statistics with Applications. Elsevier Inc.

5. Miller, I. and Miller, M. (1999). John E. Freund's Mathematical Statistics. 6th ed. Prentice-Hall Int'l., Inc. New Jersey.

6. Mood, Graybill, and Boes. 1974. Introduction to the Theory of Statistics. Third Edition. International Student Edition. McGraw-Hill Kogakusha, Ltd.

7. https://online.stat.psu.edu/stat415/