

# Mathematical Statistics

## 6<sup>th</sup> Semester

### School of Applied Mathematical and Physical Sciences

The topics will cover are as follows (Probability Theory assumed to be known):

1) Estimation Theory: Consistency, Completeness, factorization theorem, Exponential family of Distributions, Unbiased Estimators, Mean Square Error, Unbiased Estimators with Minimum Variance, Rao-Blackwell Theorem, Fisher Information, Cramer-Rao Inequality, Method of Moments, Method of Maximum Likelihood.

2) Confidence Intervals (CI): Confidence Intervals for normally distributed populations (CI for the mean when the variance is known, CI for the mean when the variance is unknown, CI for the variance, CI for the difference of the means of two independent populations with known variances, CI for the difference of the means of two independent populations with unknown but equal variances, CI for the difference of the means of two independent populations with unknown and unequal variances, CI for the ratio of the variances of two independent populations, CI for the difference of the means of two correlated populations), CI using the central limit theorem for non normal populations, general way to construct CI.

3) Hypothesis Testing: Definitions, Types of errors, power, uniformly powerful tests, Neyman-Pearson Lemma, Maximum likelihood ratio test (examples: test of the mean of a normal population with known variance, test of the mean of a normal population with unknown variance).

#### Bibliography:

Bain, L.J and Engelhardt, M. (1992). *Introduction to Probability and Mathematical Statistics*. 2<sup>nd</sup> Edition. Duxbury Press. California.

Casella, G. and Berger, O. (2002). *Statistical Inference*. 2<sup>nd</sup> Edition. Duxbury Press. California.

Roussas, G.G. (1973). *A First Course in Mathematical Statistics*. Addison – Wesley Educational Publishers. New York.

Wackerly, D.D., Mendenhall, W. and Scheaffer, R.L. (2008). *Mathematical Statistics with Applications*. 7th Edition. Brooks/Cole, Cengage Learning. Belmont.