Course Name: Introduction to Statistics and Econometrics

Course No.: IE 408

Course credit: 4

Instructor: Dr. Mandira Sarma (Room 335, SIS II, contact: msarma.ms@gmail.com)

1. **Probability and Random Variables**: Definitions and axioms of probability, probability set functions; random variables and probability distributions, transformation of random variables, moments and moment generating function; characteristic functions (briefly); Well known probability distributions - Binomial, Poisson, Geometric, Uniform, exponential, Normal etc.; Bivariate and Multivariate random vectors, Distribution of functions of random variables, Chi-square, t-, F distributions.
2. **Asymptotic Theory:** Convergence in Probability, Convergence in Distribution, Law of Large Numbers, Central Limit Theorem.
3. **Statistical Inference:** Sampling and associated concepts, Concept of sampling distribution; Estimation - Unbiasedness, asymptotic unbiasedness, consistency, and efficiency of estimators. Method of maximum likelihood and properties of MLE estimators; Testing of hypotheses, errors of first and second kind, power of the test, and likelihood ratio test.
4. **Simple Linear Regression**: Method of least squares, properties of OLS estimators and goodness of fit. Gauss Markov Theorem.
5. **Multiple Linear Regression Analysis:** General case (k-explanatory variables); examples with k=2 & 3; multiple correlation coefficient coefficient and goodness of fit. Problem of multicollinearity.
6. **Inference in the Multiple Regression Model:** Hypothesis testing for significance of a subset of coefficients; and overall significance.
7. **Generalized Least Squares and Feasible Least Squares:** Violation of assumption on spherical errors (problems of autocorrelation and heteroscedasticity), GLS and FGLS. Tests to detect autocorrelation and heteroskedasticity. Problem of autocorrelation in lagged dependent variable models.

References:

Robert Hogg, Joseph W. McKean and Allen T. Craig: *Introduction to Mathematical Statistics* (6th edition, 2005), Pearson Education

John A. Rice: *Mathematical Statistics and Data Analysis* (3rd Edition, 2007), Cengage Learning.

Robert Hogg and Eliot Tanis: *Probability and Statistical Inference* (7th edition, 2006)

James Stock and R.W. Watson: *Introduction to Econometrics* (International edition 2007)

Jeffrey Wooldridge: *Introductory Econometrics: A Modern Approach* (2006).

Additional reading list will be provided in class as and when required.