

**Code: ECON-305**

**Title: Econometrics-I**

**Credit Hours: 03**

**Prerequisite: Elementary Statistics, Probability and Probability Distributions**

**Objectives:**

This is a foundation course for enabling the students of Economics to analytically formulate and statistically estimate the economic problems for verifying the empirical validity of theoretical models. The course contents range from data transformation to the analyses of both latitudinal and longitudinal data. The analytical skill is supported by the usage of different Econometrics Software.

**Lab work**

The students are required to devote at least two hours per week to computer laboratory. They have to attend classes to learn various Econometrics software for practical application of

Econometric models they have learnt so far.

## **Course Contents**

### **Introduction**

Definition and scope of Econometrics, Economic theory as the basis for empirical analysis, Mathematical and Econometric models, Application of Statistical techniques to Economic data, Ingredients of Econometric modeling: Specification, Estimation, Evaluation and Forecasting. Data Types and Sources, Cross-sectional data, time-series data and pool data, Data at current and constant prices, Sources of data.

### **The Simple Two-Variable Model**

Simple Regression function, population and regression function, linear regression function: linearity in variables and linearity in parameters, Simple Regression Analysis: Estimation, Method of Ordinary Least Squares (OLS), Estimation of regression equation using OLS, Standard error of estimates, Numerical properties of OLS estimators, Statistical properties of OLS estimators (BLUE), Classical Linear Regression Model (CLRM), Assumptions of CLRM, Estimation of the coefficient of determination, Interval estimation of regression coefficients, Classical Normal Linear Regression Model (CNLRM), Difference between CLRM and CNLRM, Properties of OLS estimates under CNLRM, Simple Linear Regression Analysis: Inference, Confidence interval approach for regression coefficients, Test of significance approach for regression coefficients, Analysis of variance (ANOVA), Test of the overall significance of the model, Simple Linear Regression Analysis: Extensions, Regression through the origin, Scaling and measurement of variables, Regression on standardized variables Functional Forms of Regression Function, Log linear models, Cobb Douglas production function Log-Lin models, The constant growth model, Estimating the growth rate, Lin-Log models, Engel curve, Reciprocal models.

### **The Multiple Linear Regression Model (MLRM)**

Multiple Regression Analysis, Difference between simple and multiple regression analysis, Interpretation of multiple regression function, Multiple Regression Analysis: Estimation, OLS estimation of multiple regression equation, Standard error of partial regression coefficients, Properties of OLS estimators, Coefficient of determination ( $R^2$ ),  $R^2$  and Adjusted  $R^2$ , Multiple Regression Analysis: Inference, Test of individual significance (t-test), Test of overall significance (F-test) Multiple Regression Function: Extensions, Testing the equality of parameters, Testing linear equality restriction, Testing for structural stability of regression models: The Chow test.

### **Deviation from the Classical Assumptions**

Assumptions of the classical model and economic reality, Relaxation of the assumptions and estimation issues, Brief introduction to the nature of problems and alternatives.

### **Multicollinearity**

Linear relationship between any two explanatory variables, Nature and severity of the problem, OLS estimation of regression equation in the presence of perfect multicollinearity, Causes of multicollinearity, Distinction between perfect and partial Multicollinearity, Detection of the problem and remedial measures.

## **Heteroskedasticity**

Meaning of Heteroskedasticity, The nature of the problem with reference to economic theory, Cross-section data and the problem of non-constant variances, Consequences for OLS estimators, Detection of the problem and remedial measures in brief, Introduction to the Generalized Least-Squares model (GLS).

## **Autocorrelation**

Autocorrelation and its causes, Time-series data and emergence of the problem with reference to economic theory, Serial Correlation, The AR (1) process, Consequences of Autocorrelation for OLS estimators, Detection of the problem and remedial measures.

## **Recommended Books:**

- Gujrati, D. J. Basic Econometrics – 4th Edition (2003) McGraw-Hill Company.
- Maddala, G. S. (1988) Econometrics – McGraw-Hill Company.
- Dougherty, C. (2002). Introduction to Econometrics–2nd edition Oxford University Press.
- Pindyck & Rubinfeld (1992). Econometric Models & Economic Forecasts- 3<sup>rd</sup> Edition, McGraw-Hill Inc.
- Stock H. J. and M. W. Watson (2003). *Introduction to Econometrics*, India: Pearson Education.