

Gokhale Institute of Politics and Economics

Syllabus for Certificate Course in Computer Application in Economic Analysis (CAEA2018-19):

Prerequisites: This is an applied econometrics course using the popular statistical software packages used by empirical economists/ analysts. What distinguishes these modules is the adoption of the modern learning-by-doing approach to teaching econometrics, which emphasizes the application of econometrics to real world problems. The focus is on understanding the theoretical aspects that are critical in applied work and the ability to correctly interpret empirical results.

Course Structure: The content of the course will be presented by means of practical hand-on sessions. The sessions will demonstrate the concepts and methods of statistics with practical examples of different dimensions. The course will cover wide data sets Solution of some of the problem set will be discussed in the classes.

Course Objectives: This course is for graduate students. There will be a strong emphasis on the concepts and application of probability theory, random variables, distributions, sampling theory, statistical inference, correlation and regression.

Statistical inference techniques such as estimation and significance testing are important in the fitting and interpretation of econometric models. Correlation and regression analysis are essential tools for measuring relationships between variables and for prediction.

This course should be of value to those intending to study any course involving economic modeling and econometrics.

Outcome: By the end of the module you should be competent in applying the mathematical and statistical tools used in econometrics and should be able to:

1. handle real data with confidence
2. apply econometric methods of analysis to new circumstances
3. understand the conditions under which particular estimators are appropriate
4. apply the theoretical methods to numerical data
5. write and present technical material lucidly
6. understand the basic theory of the ordinary least squares, generalized least squares and panel data models
7. apply appropriate estimators to the type of numerical data given in seminar exercises and computing classes
8. interpret empirical results in applied economics literature

Texts: As stand-alone resources will be provided, there will be no need to rely on particular texts. However, there are several good texts are now available which can be used as supplementary materials, including:

- Baltagi, Badi H. 2005. **Econometric Analysis Of Panel Data** (3rd edition). Chichester, UK: Wiley and Sons.
- J M Wooldridge, 2009. **Introductory Econometrics – A Modern Approach** (4th ed), South-Western, 2009 (International Student Edition)
- Christopher F Baum, 2006. **An Introduction to Modern Econometrics using Stata**, Stata Press books, StataCorp LP, number imeus, September.

Module No.	Content
Module1:	<p>Model Specification: Data classification, role of data in modeling, exploratory data analysis, different dimensions of data – social, time, spatial etc.</p> <p>Modeling average: working with real world dataset (usefulness and shortcomings of modeling mean, relative efficiency of mean and median, confidence interval and its interpretation, etc.)</p>
Module 2:	<p>Outlier detection, shape of the distribution and data transformation: Least square principle and concept of resistance, mean-based vs. ordered-based statistics, etc.</p> <p>Outlier detection, validity of normality assumption, data transformation using cross-sectional data.</p>
Module 3:	<p>Linear regression and least squares principle: Basic principles and discussion on theoretical background</p> <p>Regression with graphics – checking the model assumption, exploratory band regression, checking of high leverage & influential points, transformation of data towards linearity, double-log transformation vs. semi-log transformation, etc.</p>
Module 4:	<p>Interpretation of multiple regression coefficients Hierarchical sequence of simple regression, introduction of added variable plot, etc.</p> <p>Working with different macroeconomic data set, money illusion in the demand function, partial vs. multiple regressions, decomposing the sum of squares across regression, coefficient of determination, partial regression vs. partial coefficients, checking the assumptions of regression model, etc.</p>

Module 5:	<p>Model selection/misspecification in multiple regression</p> <p>Section1: Omitted variable bias, testing zero restrictions/non zero linear restrictions, etc.</p> <p>Section2: Parameter stability using macroeconomic database, use of dummy variables, etc.</p>
Module 6:	<p>Heteroscedasticity:</p> <p>Detecting heteroscedasticity, different test statistics, and transformation towards homoscedasticity.</p> <p>Detecting heteroscedasticity by graphical method using survey data, finding appropriate transformation, working with group data, etc.</p>
Module 7:	<p>Regression on categorical variable:</p> <p>Handling different data sets where dependent variable is categorical, preparation, distributional and contingency tables, test of association, Logit and Probit modeling, comparing logit with linear probability model.</p>
Module 8:	<p>Time series analysis vs. spatial analysis</p> <p>Stationarity and Non-Stationarity of data, different types of ordering of data, structural autocorrelation vs. temporal autocorrelation, Trend analysis, etc.</p> <p>Trend analysis with stationary autoregressive component, use of spreadsheet for constructing autoregressive model. Transformation to stationarity: stabilizing variance, stabilizing mean, Detecting autocorrelation, 'genuine' autocorrelation vs. 'nuisance' autocorrelation, etc. Time - space, social autocorrelation and different measurement techniques.</p>
Module 9:	<p>Panel data analysis</p> <p>Panel data, complicity of panel data analysis, short vs. long panel, balanced vs. unbalanced panel, clustering of residual, types of regressor, model endogeneity, fixed effect models (i.e. Least Square Dummy Variable based Panel regression, Entity-based Panel Regression, Absorb Panel, etc), random effects models (GLS Panel), Nickell Bias in FE model, Dynamic Panel, Anderson-Hsiao estimator, Generalized Methods of Moments (GMM) in estimating panel regression.</p>
<p>At this stage, students will be asked for assessment tests which include submission of the assignments and formal examination.</p> <p>Grades for the course will be computed based on the following allocation:</p> <ol style="list-style-type: none"> 1. Final exam (80%) [short objective types + practical exercises + result interpretation and report writing on the basis of given dataset] 2. Assignments (three) (20%) 	