Course Details:

Course Title: Fundamental of Econometrics **Credit Hours:** 3
Course Code: ECO-215
Pre-requisite: Statistics-II STAT-221

Course escription:

These days businesses keep records of several kinds of data on various aspects of their business. Proper use of these data could greatly help businesses to grow and make more informed discussions. There are several domains of analysis that could help businesses to do better decision-making using their own recorded data or data from other sources. The science of econometrics is one such domain that can help businesses to make better decisions using primary and secondary data. Econometrics initially started as a branch of economics but over a period emerged as an important separate science with many applications in finance, business, and other social sciences.

This course is a basic level econometric that focuses on techniques for estimating regression models, on problems commonly encountered in estimating such models, and on interpreting the estimates from such models. The goal of this course is to teach the students the basics of the theory and practice of econometrics and to give them experience in estimating econometric models with actual data.

Course Learning Outcomes:

Upon completion of the course, students should be able to:

- **CLO 1.** ***Translate*** a theoretical model of observed phenomena into an econometric model.
- **CLO 2.** ***Understand*** the key concepts of basic linear regression analysis and its assumptions.
- **CLO 3.** ***Examine*** various issues associated with linear regression models in business settings.
- **CLO 4.** ***Apply*** knowledge of regression models to business decisions making.

Required Course Material:

Textbook (s):

1. Introductory Econometrics, 7th Edition, J. M. Wooldridge Cengage Learning.

Reference Book (s):

1. Econometrics by Examples, by Darnodar Gujarati (latest Edition) McGraw-Hill.
2. Basic Econometrics, by Darnodar Gujarati (latest Edition) Palgrave Macmillan.

Other Material:

1. Economic Survey of Pakistan (Latest), Ministry of Finance, Government of Pakistan, Islamabad

Weekly Schedule:

Week	Lecture No. and Topic	Preparation Material	Session Outcomes (Students should be able to…)
1	**LECTURE 1:** Introduction • Discussion on course outlines • Introduction to econometrics • Econometric Study • Econometrics applications in business	Chap 1: Woolridge	(CLO 1) (CLO 2)
	LECTURE 2: Statistical background for Econometrics • Types of variables, probability distribution, hypothesis testing, correlation	Course books of Statistics I and II	(CLO 1) (CLO 2)
2	**LECTURE 3:** Basic Regression Model: Theory • Economic Model • Linear regression model: Theory • Types and sources of data	Chap 2: Woolridge	(CLO 1)
	LECTURE 4: Basic Regression Model: Estimation • Introduction to Ordinary Least Squares (OLS) Method • Application of OLS to Simple and Multiple Regression model	Chap 2: Woolridge	(CLO 2)
3	**LECTURE 5:** Classical Linear Regression Model • OLS assumptions	Chap 2 & 3: Woolridge	(CLO 2)
	LECTURE 6: Classical Linear Regression Model (Continue) • Variance and S.E of OLS estimators • Hypothesis testing in regression (t and F Tests)	Chap 4: Woolridge	(CLO 2)
	• R^2 and Adjusted R^2 • Application of OLS to Wage Data and forecasting		
4	**LECTURE 7:** Functional forms of regression models I (Theory, estimation, and interpretation) • Log-linear Models, Double-log, or constant elasticity models • Case Study	Chap 6: Woolridge	(CLO 1) (CLO 4)
	LECTURE 8: • Testing the validity of linear restrictions • Cobb-Douglas production function • Case study	Chap 6: Woolridge	
5	**LECTURE 9:** Functional forms of regression models II (Theory, estimation, and interpretation) • Log-Lin or growth model and its case study • Linear trend model and its case study	Chap 6: Woolridge	(CLO 1) (CLO 4)

	LECTURE 10: • Lin-log model and its case study • Reciprocal model and its case study	Chap 6: Woolridge	
6	**LECTURE 11:** Functional forms of regression models III (Theory, estimation, and interpretation) • Polynomial regression model and its case study • Choice of the functional form of a model	Chap 6: Woolridge	(CLO 1) (CLO 4)
	LECTURE 12: • Comparing linear and log-linear models • Regression of standardized variables • Measures of goodness of fit (R^2, Adjusted-R^2, AIC, SIC and HQC)	Chap 6: Woolridge	
7	**LECTURE 13:** Regression models with Qualitative Variables I • Background • Dummy variables and dummy variables trap • Interpretation of dummy variables • Estimation and interpretation of regression with dummy variables	Chap 7: Woolridge	(CLO 1)
	LECTURE 14: Regression models with Qualitative Variables II • Interactive dummy variables • Differential dummy variables • Application, estimation, and interpretation	Chap 7: Woolridge	
8	**LECTURE 15:** Regression models with Qualitative Variables III ▪ Use of dummy variables in structural change ▪ Use of dummy variables in seasonal data	Chap 7: Woolridge	(CLO 4)
	LECTURE 16: Regression models with Qualitative Variables IV • Depersonalization of a time series • Empirical examples using Sales data • Application and interpretation	Chap 10: Woolridge	
9	**MID-TERM EXAM WEEK**		
10	**LECTURE 17:** Regression Diagnostic I: Multicollinearity (Theory and Applications) ▪ Consequences of Multicollinearity ▪ Detection of Multicollinearity ▪ Case Study ▪ Checking for multicollinearity	Chap 6 &7: Woolridge	(CLO 3) (CLO 4)
	LECTURE 18: ▪ Remedial measures of Multicollinearity ▪ Introduction to principal components (PCA) method	Chap 6 &7: Woolridge	

11	**LECTURE 19:** Regression Diagnostic II: Heteroscedasticity (Theory and Applications) ▪ Concept of heteroscedasticity ▪ Causes of heteroscedasticity ▪ Consequences of heteroscedasticity ▪ Case Study	Chap 8: Woolridge	(CLO 3) (CLO 4)
	LECTURE 20: Detection of heteroscedasticity ▪ Graphical Method ▪ Tests (BP Test, White Test, others) ▪ Case Study	Chap 8: Woolridge	
12	**LECTURE 21:** Remedial measures for heteroscedasticity ▪ Transformation when variance is known (general transformation) ▪ Case Study	Chap 8: Woolridge	(CLO 3) (CLO 4)
	LECTURE 22: Remedial measures for heteroscedasticity ▪ Transformation when variance is unknown (guessing the value of unknown variance) ▪ Specification bias & heteroscedasticity ▪ Case Study ▪ White Method for hetero-corrected S.E.	Chap 8: Woolridge	
13	**LECTURE 23:** Regression Diagnostic III: Autocorrelation (Theory and Applications) ▪ Concept of autocorrelation ▪ Causes of Autocorrelation	Chap 12: Woolridge	(CLO 3) (CLO 4)
	LECTURE 24: Consequences of Autocorrelation ▪ Case Study	Chap 12: Woolridge	
14	**LECTURE 25:** Tests of autocorrelation ▪ Graphical Method ▪ Durbin Watson Test ▪ BG- Test	Chap 12: Woolridge	(CLO 3) (CLO 4)
	LECTURE 26: Remedial measures ▪ Background ▪ Use of the first Difference method ▪ Different ways to get values of autocorrelation coefficients ▪ Case study ▪ Remedial measuring using Hetero-Auto corrected S.E procedure (HAC)	Chap 12: Woolridge	
15	**LECTURE 27:** Regression Diagnostic IV: Model Specification Errors (Theory and Applications) ▪ Model overfitting (theory and tests) ▪ Model under-fitting (theory and tests)	Chap 9: Woolridge	(CLO 3) (CLO 4)
	LECTURE 28: consequences for OLS estimation in case of: ▪ Outliers in data ▪ Measurement errors in dependent/independent variables ▪ Non-random independent variables ▪ simultaneity bias	Chap 9: Woolridge	
16	**LECTURE 29:** Introduction to Advance topics in Econometrics ▪ Introduction to Microeconometrics (A brief introduction to models used for cross-section data)	Chap 14: Woolridge	(CLO 3)

	LECTURE 30: Introduction to Time Series Econometrics (A brief introduction to models used for Time Series Data)	Chap 18: Woolridge	
17	**BUFFER WEEK**		
18	**FINAL EXAM WEEK**		