Syllabus template

Semester: 4	
Course : Economics	
Paper Title: STATISTICAL METHODS FOR ECONOMICS	
Paper code: C2EC230411T	**Credits: 4**
Hours/week : 4	
Category: Core/MDC/SEC/VAC : Core	
Theory / Practical / Composite : Theory	
No of Modules : 2	

Course Overview:

1. To study basic statistical concepts and terminology—such as population, sample, descriptive statistics, and inferential statistics—before proceeding to detailed numerical descriptive methods.
2. To study statistical ideas in a way that strengthens conceptual understanding while maintaining full analytical rigour.
3. To study correlation and regression techniques with special emphasis on their application to bivariate data.
4. To study probability theory through a traditional foundation followed by an axiomatic approach, preparing students for econometrics in higher semesters.
5. To study probability distributions of discrete and continuous random variables, with particular focus on key theoretical distributions.
6. To study the fundamentals of joint distributions for discrete and continuous random variables, including the structure and relevance of the bivariate normal distribution.

Course Outcome:

Module 1:

1. Identify key descriptive statistical tools—including measures of central tendency, dispersion, moments, skewness, and kurtosis—and recognize their role in summarizing data.
2. Describe methods of presenting data, constructing frequency distributions, and explaining relationships in bivariate datasets through correlation and regression.
3. Apply statistical techniques to organize datasets, compute descriptive measures, and interpret bivariate frequency distributions in practical contexts.
4. Analyze sample spaces, event structures, and the logical relationships among events using probability axioms and counting methods.
5. Evaluate conditional probability, independence of events, and applications of Bayes' rule to judge uncertainty in various real-world situations.
6. Construct complete statistical summaries and probability-based explanations to model empirical problems and support data-driven decision-making.

Module 2:

1. Recognize different types of random variables and distinguish among discrete and continuous probability distributions used in statistical modelling.
2. Interpret the properties, expectations, means, and variances of key distributions—Binomial, Poisson, Uniform, Normal, and Exponential—to explain their relevance in applied contexts.

3. Utilize distribution formulas to compute probabilities, expectations, and other theoretical measures for both discrete and continuous random variables.				
4. Examine joint probability mass and density functions to understand marginal and conditional relationships between two random variables.				
5. Assess the structure of the bivariate normal distribution by determining its means, variances, and correlation coefficients to judge dependence patterns.				
6. Develop probability-based representations of real-world situations by integrating univariate and joint distribution concepts into coherent analytical models.				
Prerequisites: ***cumulative knowledge of previous semesters needed***				
SYLLABUS				
UNIT/Module	**CONTENT**	**HOURS or NUMBER OF CLASSES**	**CO Mapping**	**COGNITIVE LEVEL**
I.	• **Descriptive Statistics:** Presentation of Data; Frequency Distribution; Measures of central tendency, Dispersion, Moments, Skewness and Kurtosis; Bivariate Frequency Distribution-correlation and regression. • **Elementary Probability Theory:** Sample Space and events; probability axioms and properties; counting techniques; conditional probability; Bayes' rule and independence of events.	2 classes per week	CO1, CO2, CO3, CO4, CO5, CO6	K1,K2, K3, K4, K5, K6
II.	• **Univariate Probability Distribution :** Random variable and probability distributions; Discrete and continuous, Expectation of a random variable; Discrete Distribution, Binomial, Poisson; Continuous Distributions-Uniform, Normal, Exponential (Properties of each distribution; mean and variance). • **Jointly Distributed Random Variables:** Joint Probability mass function, marginal and conditional probability function; Joint density function, marginal and conditional density function; Density function of Bivariate normal distribution and obtaining means, variances, and correlation coefficients.	2 classes per week	CO1, CO2, CO3, CO4, CO5, CO6	K1,K2, K3, K4, K5, K6
Text Books				

1. Jay L. Devore, Probability and Statistics for Engineers, Cengage Learning, 2010..
2. John E. Freund, Mathematical Statistics, Prentice Hall, 1992
3. Richard J. Larsen and Morris L. Marx, An Introduction to Mathematical Statistics and its Applications, Prentice Hall, 2011.
4. William G. Cochran, Sampling Techniques, John Wiley, 2007.

Suggested readings

1. R.V. Hogg . and A.T. Craig , An Introduction to Mathematical Statistics, Third Edition, Amerind, New York, London.
2. Mood, A.M., F.A.Graybill and D.C. Boes: Introduction to The Theory of Statistics, McGraw Hill, 1974.

Web Resources

NA

Evaluation :CIA: 30 (20+5+5)+ End Semester:70

Paper Structure for Theory Semester Exam:

Module	No. of questions to be answered	No. of alternatives given	Marks
Module 1 (35 marks)	3	4	3×5=15
	2	3	2×10=20
Module 2 (35 marks)	3	4	3×5=15
	2	3	2×10=20
		Total	**70**

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
	Module 1	
CO1	Identify key descriptive statistical tools—including measures of central tendency, dispersion, moments, skewness, and kurtosis—and recognize their role in summarizing data.	K1
CO2	Describe methods of presenting data, constructing frequency distributions, and explaining relationships in bivariate datasets through correlation and regression.	K2
CO3	Apply statistical techniques to organize datasets, compute descriptive measures, and interpret bivariate frequency distributions in practical contexts.	K3
CO4	Analyze sample spaces, event structures, and the logical relationships among events using probability axioms and counting methods.	K4
CO5	Evaluate conditional probability, independence of events, and applications of Bayes' rule to judge uncertainty in various real-world situations.	K5
CO6	Construct complete statistical summaries and probability-based explanations to model empirical problems and support data-driven decision-making.	K6
	Module 2	

CO1	Recognize different types of random variables and distinguish among discrete and continuous probability distributions used in statistical modelling.	K1
CO2	Interpret the properties, expectations, means, and variances of key distributions—Binomial, Poisson, Uniform, Normal, and Exponential—to explain their relevance in applied contexts.	K2
CO3	Utilize distribution formulas to compute probabilities, expectations, and other theoretical measures for both discrete and continuous random variables.	K3
CO4	Examine joint probability mass and density functions to understand marginal and conditional relationships between two random variables.	K4
CO5	Assess the structure of the bivariate normal distribution by determining its means, variances, and correlation coefficients to judge dependence patterns.	K5
CO6	Develop probability-based representations of real-world situations by integrating univariate and joint distribution concepts into coherent analytical models.	K6