



Department of Statistics
Rabindranath Tagore University

SYLLABUS

(NEP)

Course Structure:

Year	Semester	Course Code	Nature of the course	Title of the course	Total Credits
1 st	1 st	MIN-STAT-1.1	Minor	Basic Statistical Methods	4
	2 nd	MIN-STAT-2.1	Minor	Basic Probability theory and Distribution	4
2 nd	3 rd	MIN-STAT-3.1	Minor	Statistical Inference	4
	4 th	MIN-STAT-4.1	Minor	Applied Statistics	4

DETAILED SYLLABUS OF 1ST SEMESTER

Title of the Course	: Basic Statistical Methods
Course Code	: MIN-STAT-1.1
Nature of the course	: Minor
Total Credits	: 04
Distribution of marks	: 60 (End Sem) (60T+25P) + 15 (In-Sem)

COURSE OBJECTIVES:

- To be familiar with basic tools and techniques of descriptive Statistics.
- To apply the knowledge in the context of an applied topic such as index number.

UNITS	CONTENTS	L	T	P	TOTAL HOURS
1 (12 Marks)	Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, primary and secondary, attributes, variables, scales of measurement nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram and ogives, Categorical data: Attributes and different measures of their association.	8	1	-	9
2 (16 Marks)	Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections.	10	2	-	12
3 (16 Marks)	Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.	10	2	-	12
4 (16 Marks)	Index Numbers: Definition, construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Marshall and Fisher's. Chain index numbers, conversion of fixed based to chain based index numbers and vice-versa. Consumer price index numbers (Core and Headline).	10	2	-	12
5 (25 Marks)	List of Practicals: 1. Graphical representation of data. 2. Problems based on measures of central tendency. 3. Problems based on measures of dispersion. 4. Problems based on combined mean and variance and coefficient of variation. 5. Problems based on moments, skewness and kurtosis. 6. Fitting of polynomials, exponential curves. 7. Karl Pearson correlation coefficient. 8. Correlation coefficient for a bivariate frequency distribution. 9. Lines of regression, angle between lines and estimated values of variables. 10. Spearman rank correlation with and without ties. 11. Partial and multiple correlations. 12. Planes of regression and variances of residuals for given simple correlations.	-	-	15	30

	13. Planes of regression and variances of residuals for raw data. 14. Calculate price and quantity index numbers using simple and weighted average of price relatives. 15. To calculate the Chain Base index numbers. 16. To calculate consumer price index number.				
	TOTAL	38	7	15	75

Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT:

15 Marks

- One Internal Examination 10 Marks
- Others (any one) 05 Marks
 - Group Discussion
 - Seminar presentation on any of the relevant topics
 - Debate

LEARNING OUTCOMES:

After the completion of this course

- Students are expected to develop a clear understanding of the fundamental concepts of descriptive Statistics.
- Students will also learn handling various types of data and their graphical representation.
- Students are expected to apply different measures of location and dispersion in real life problems.
- Students will also learn handling bivariate data and are expected to understand significance of various coefficients of correlation, fitting of linear/nonlinear curve and formulation index numbers.

SUGGESTED READINGS:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd, Delhi.
4. Barman. M. P., Hazarika. J, Bora. T (2021): Statistical Methods, Mahaveer Pub, Dibrugarh.

DETAILED SYLLABUS OF 2ND SEMESTER

Title of the Course	: Basic Probability theory and Distribution
Course Code	: MIN-STAT-2.1
Nature of the course	: Minor
Total Credits	: 04
Distribution of marks	: 60 (End Sem) (60T+25P) + 15 (In-Sem)

COURSE OBJECTIVES:

- To be familiar with probability theory.
- To learn different methods of studying a theoretical distribution.
- To study useful probability distributions and their properties.

UNITS	CONTENTS	L	T	P	TOTAL HOURS
1 (12 Marks)	Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability—classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem and its applications.	8	1	-	9
2 (16 Marks)	Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables, bivariate transformations with illustrations.	10	2	-	12
3 (16 Marks)	Mathematical Expectation and Generating Functions: Expectation of single and bivariate random variables and its properties. Moments and Cumulants, moment generating function, cumulant generating function and characteristic function. Uniqueness and inversion theorems (without proof) along with applications. Conditional expectations.	10	2	-	12
3 (16 Marks)	Standard probability distributions: Binomial, Poisson, geometric, negative binomial, hypergeometric, uniform, normal, exponential, Cauchy, beta and gamma along with their properties and limiting/approximation cases.	10	2	-	12
4 (25 Marks)	List of Practicals: 1. Fitting of binomial distribution. 2. Fitting of Poisson distribution. 3. Fitting of geometric distribution. 4. Fitting of negative binomial distribution. 5. To find the ordinate for a given area for normal distribution. 6. Fitting of normal distribution. 7. Fitting of exponential distribution.			15	30
	TOTAL	38	7	15	75

Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT:

15 Marks

- One Internal Examination
- Others (any one)
 - Group Discussion
 - Seminar presentation on any of the relevant topics
 - Debate

10 Marks

05 Marks

LEARNING OUTCOMES:

After the completion of this course

- Students should have developed knowledge of the role of probability theory in Statistics.
- Students are expected to learn useful probability distributions in statistical analyses.

SUGGESTED READINGS:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi.

DETAILED SYLLABUS OF 3RD SEMESTER

Title of the Course	: Statistical Inference
Course Code	: MIN-STAT-3.1
Nature of the course	: Minor
Total Credits	: 04
Distribution of marks	: 60 (End Sem) (60T+25P) + 15 (In-Sem)

COURSE OBJECTIVES:

- To study useful sampling distributions and their properties.
- To make informative decision using statistical tests.

UNITS	CONTENTS	L	T	P	TOTAL HOURS
1 (15 Marks)	Concepts of estimation, unbiasedness, consistency and efficiency. Sufficiency. Factorization theorem. Complete statistic, Minimum variance unbiased estimator (MVUE)	9	2		11
2 (15 Marks)	Tests of Hypothesis: The basic idea of significance test. Null and alternative hypothesis. Type I & Type II errors, level of significance, concept of p-value. Tests of hypotheses for the parameters of a normal distribution (one sample), Non-parametric tests: Sign test for median, Sign test for symmetry, Wilcoxon two-sample test.	10	2	-	12
3 (15 Marks)	Categorical Data Analysis: Categorical data: Tests of proportions, tests of association and goodness-of-fit using Chi-square test, Yates' correction.	9	2	-	11
4 (15 Marks)	Analysis of Variance: Analysis of variance, one-way and two-way classification. Brief exposure of three basic principles of design of experiments, treatment, plot and block. Analysis of completely randomized design, randomized complete block design. Bioassay.	9	2	-	11
5 (25 Marks)	List of Practicals: 1. Estimators of population Mean 2. Confidence interval for the parameters of a normal distribution (one sample). 3. Tests of hypotheses for the parameters of a normal distribution (one sample). 4. Chi-square test of proportions. 5. Chi-square tests of association. 6. Chi-square test of goodness-of-fit. 7. Test for correlation coefficient. 8. Sign test for median. 9. Sign test for symmetry. 10. Wilcoxon two-sample test. 11. Analysis of Variance of a one way classified data 12. Analysis of Variance of a two way classified data. 13. Analysis of a CRD. 14. Analysis of an RBD.	-	-	15	30
TOTAL		39	6	15	75

Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination

15 Marks

10 Marks

- Others (any one)
 - Group Discussion
 - Seminar presentation on any of the relevant topics
 - Debate

05 Marks

LEARNING OUTCOMES:

After the completion of this course

- Students should possess skills concerning the small sample and large sample tests.
- Students are expected to analyze and interpret the data vis-à-vis statistical inference in data analysis.

SUGGESTED READINGS:

1. Mukhopadhyay, P. (1999): Applied Statistics, Books and Allied (P) Ltd.
2. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition, World Press.
3. Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley Eastern Ltd.
4. Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1973): Applied General Statistics, 3rd Edition. Prentice Hall of India Pvt. Ltd.
5. Keyfitz N., Beckman John A.: Demography through Problems S-Verlag New York.

DETAILED SYLLABUS OF 4TH SEMESTER

Title of the Course	: Applied Statistics
Course Code	: MIN-STAT-4.1
Nature of the course	: Minor
Total Credits	: 04
Distribution of marks	: 60 (End Sem) (60T+25P) + 15 (In-Sem)

COURSE OBJECTIVES:

- To understand useful applications of statistics in Economics, Industry and Society.

UNITS	CONTENTS	L	T	P	TOTAL HOURS
1 (15 Marks)	Time Series: Components of time series, Decomposition of time series- Additive and multiplicative model with their merits and demerits, Illustrations of time series. Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares (linear, quadratic and modified exponential). Measurement of seasonal variations by method of ratio to trend.	10	2	-	12
2 (15 Marks)	Index numbers: Definition, Criteria for a good index number, different types of index numbers. Construction of index numbers of prices and quantities, consumer price index number. Uses and limitations of index numbers.	9	2	-	11
3 (15 Marks)	Statistical Quality Control: Importance of statistical methods in industrial research and practice. Determination of tolerance limits. Causes of variations in quality: chance and assignable. General theory of control charts, process & product control, Control charts for variables: X-bar and R-charts. Control charts for attributes: p and c-charts	10	2	-	12
4 (15 Marks)	Demand Analysis: Theory of consumption and demand, demand function, elasticity of demand, determination of elasticity of demand by family budget method, Lorentz curve and Gini's coefficient, Engel's law and Engel's curve, Pareto's law of income distribution.	9	1	-	10
5 (25 Marks)	List of Practicals: 1. Measurement of trend: Fitting of linear, quadratic trend, exponential curve and plotting of trend values and comparing with given data graphically. 2. Measurement of seasonal indices by Ratio-to-trend method and plotting of trend values and comparing with given data graphically. 3. Construction of price and quantity index numbers by Laspeyre's formula, Paasche's formula, Marshall-Edgeworth's formula, Fisher's Formula. Comparison and interpretation. 4. Construction of wholesale price index number, fixed base index number and consumer price index number with interpretation 5. Construction and interpretation of X bar & R-chart 6. Construction and interpretation p-chart (fixed sample size) and c-chart	-	-	15	30

	TOTAL	38	7	15	75
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Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT:

15 Marks

- One Internal Examination 10 Marks
- Others (any one) 05 Marks
 - Group Discussion
 - Seminar presentation on any of the relevant topics
 - Debate

LEARNING OUTCOMES:

After the completion of this course

- Students should have a clear understanding of Time Series Analysis
- Students should have a clear understanding of index numbers.
- Students should have clear understanding statistical quality control.
- Students should have clear understanding of Demand analysis

SUGGESTED READINGS:

1. Mukhopadhyay, P. (1999): Applied Statistics, New Central Book Agency, Calcutta.
2. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9th Edition World Press, Kolkata.
3. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edition (Reprint), Sultan Chand & Sons.
4. Montgomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition, Wiley India Pvt. Ltd.