SYLLABUS
STATISTICS: ELECTIVE
(For Student w.e.f. Session 2014-2015)

SEMESTER			CREDIT	L	T	P
I	ET-3-STS-101	DESCRIPTIVE STATISTICS	3	3	0	0
	EP-2-STS-102	PRACTICAL	2	0	0	2
II	ET-3-STS-203	PROBABILITYAND DISTRIBUTION	3	3	0	0
	EP-2-STS-204	PRACTICAL	2	0	0	2
III	ET-3-STS-305	ESTIMATION AND TESTING OF HYPOTHESES	3	3	0	0
	EP-2-STS-306	PRACTICAL	2	0	0	2
IV	ET-3-STS-407	DESIGN OF EXPERIMENTS & SAMPLE SURVEY	3	3	0	0
	EP-2-STS-408	PRACTICAL	2	3	0	2
V	ET-3-STS-509	APPLIED STATISTICS-I	4	3	1	0
	EP-2-STS-510	PRACTICAL	3	2	0	3
VI	ET-3-STS-611	APPLIED STATISTICS II	4	3	1	0
	EP-2-STS-612	PRACTICAL	3	0	0	3

SEMESTER I

ET-3-STS -101	DESCRIPTIVE STATISTICS	CREDIT	L	T	P
		3	3	0	0

Introduction : Journey of Statistics Till Date

UNIT 1: Definition of Statistics, Limitations of Statistics. Statistical data: Types of Statistical data- quantitative and qualitative data, discrete and continuous data, primary and secondary data. Statistical population and sample. Measurement scales: nominal, ordinal, ratio and interval (with examples). Classification and Tabulation of data. Diagrammatic representation of data: bar-diagrams, Pie-diagrams, pictograms, stem-leaf display and box plot. Graphical representation of data: histograms, polygons, ogives.

UNIT 2: Measures of central tendency: Measures of central tendency and location: mean (AM, GM and HM), mode, median, merits-demerits and properties; quartiles, deciles, percentiles; determination of measures of locations graphically. Inter relationship: (i) mean, median and mode (ii) AM, GM and HM. **Measures of dispersion**: Measures of dispersion and their properties, coefficient of dispersion, coefficient of variation Moments: Relation between moments about mean in terms of moments about any point. **Skewness and kurtosis:** Skewness and kurtosis, different coefficients, skewness vis-à-vis mean median and mode. Skewness and kurtosis vis-à-vis normal curve.

UNIT 3 : Bivariate Data : Scatter diagram, correlation, Karl Pearson's coefficient of correlation and their properties & interpretation, Concept of coefficient of determination R^2, rank correlation, regression coefficients and their properties & interpretation, fitting of linear regression.

UNIT 4: Index numbers: Definitions, steps in the construction of index numbers. price and quantity indices: Laspeyre's, Paasche's, Fisher's, Marshall Edgeworth index numbers. Importance of index numbers, fixed and chain base index numbers, cost of living index number, wholesale price index number, inflation and deflation.

SEMESTER-I

EP-2-STS -102	**PRACTICALS**	CREDIT	L	T	P
		2	2	0	0

Practicals based on Paper **ET-3-STS -101**

.

Text Books :

Bio- Statistics

1. Medhi. J. (1982): Statistical Methods, New Age International (P) Ltd.
2. Goon A.M, Gupta M.K., Das Gupta B. (1991): Fundamentals of Statistics, Vol. I, World Press, Calcutta.
3. Gupta S.C. and Kapoor V.K. (2001): Fundamentals of Mathematical Statistics, Sultan Chand and Sons
4. Gupta S.C. (2008: Statistical Methods, Hindustan Publishing House.
5. Medhi. J. (1998) : Parisankhya Bigyan, New Age International (P) Ltd.
6. Choudhury, L. (2000) : Prambhik Parisankhya Bigyan, Book Land Guwahati

References :

7. Saxena H.C. (1981) : Examples in Statistics, Atma Ram & Sons
8. Agarwala, A.K. & Chakraborty, S. (2009) : Statistics : A tutorial text with practicals, Kalyani Publisher

SEMESTER-II

ET-3-STS-203	**PROBABILIT AND DISTRIBUTION**	CREDIT	L	T	P
		3	3	0	0

UNIT 1: Random experiments, events, sigma-field, sample space. Probability: Mathematical, Empirical and Set theoretic definitions. Addition theorem, Conditional Probability, Independence of events, Multiplication theorem, Bayes theorem with illustrations.

UNIT 2: Random variables, Discrete and Continuous Random Variables, Probability Mass function, Probability Density function, Cumulative Distribution function – Properties. Mathematical Expectation of random variables and functions of random variables and properties. Generating functions, Moment generating function(MGF), Probability generating function(PGF): Definitions, properties. Simple illustrative applications.

UNIT 3: Discrete Distributions: Bernoulli, Binomial, Poisson: mean,variance, PGF, MGF,

Recurrence relation. Limiting distribution: Binomial to Poisson. Continuous distribution: Uniform, Normal, Exponential- Moments, MGF; Chebyshev's inequality, Weak law of large numbers and Central Limit Theorem with applications (sans derivation).

.

UNIT 4: Basic concepts of Bi-variate distributions (Discrete and Continuous): Joint Probability Function -Marginal and conditional distribution with simple illustrations.

Text Books :

1. Gupta S.C. and Kapoor V.K. (2001), Fundamentals of Mathematical Statistics, S Chand and Sons
2. Goon A.M, Gupta M.K., Das Gupta B. (1980): An Outline of Statistical Theory, Vol. I, 6th revised edition, World Press, Calcutta.
3. Medhi. J. (1998) : Parisankhya Bigyan, New Age International (P) Ltd.
4. Dutta, J. (….) : Sambhabita, Grantha Pith, Guwahati
5. Choudhury, L. (2000) : Prambhik Parisankhya Bigyan, Book Land Guwahati

References :

6. Rohatgi V.K. and Md. Ehsanes Saleh A.K.(2001): An Introduction to Probability and Statistics, Second Edition, Wiley
7. Sheldon M. Ross (2004) : Introduction to Probability Models, Elsevier
8. Mukherjee P. (1995) : Theory of Probability, New Central Book Agency
9. Saxena H.C. (1981) : Examples in Statistics, Atma Ram & Sons
10. Agarwala, A.K. & Chakraborty, S. (2009) : Statistics : A tutorial text with practicals, Kalyani Publisher
11. Hogg R. V. and Craig A. T. (1998); Introduction to Mathematical Statistics, 4/e, Academic press.
12. Mood A.M., Graybill F.A and Boes D.C. (1974): Introduction to the Theory of Statistics, McGraw Hill.

EP-2-STS-204	**PRACTICAL**	CREDIT	L	T	P
		2	0	0	2

Practicals based on the topics of the paper **ET-3-STS-203**

SEMESTER-III

ET-3-STS-305	**ESTIMATION AND TESTING OF HYPOTHESES**	CREDIT	L	T	P
		3	3	0	0

UNIT 1: Basic idea: Population, Sample, Sampling, Parameter and Statistic**.** Point estimation**:** Properties of estimators, Unbiasedness, Asymptotically Unbiased Estimator, Minimum Variance Unbiased Estimator (MVUE), Cramer-Rao inequality (sans proof) and its uses. Consistent stimators and Efficiency with simple illustrations. Data reduction: Concepts of Sufficiency

UNIT 2: Methods of estimation: Method of Maximum Likelihood, Method of moments. Interval Estimation: Concepts of confidence interval and confidence coefficient –confidence intervals for the parameters of univariate normal. Simple illustrative examples.

UNIT 3: Statistical Hypothesis: Simple and composite hypotheses, Null and Alternative Hypotheses, Types of errors, Critical region, p-value, Power of a test. Test of significance: Exact and large sample tests for one and two sample mean and proportions based on Normal distribution, t-test for one and two sample mean, χ^2 and F-tests.

UNIT 4: Non-parametric tests: What and why are nonparametric tests ? Sign test, median test and simple illustrations.

Text Books :

1. Gupta S.C. and Kapoor V.K. (2001), Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
2. Goon A.M, Gupta M.K., Das Gupta B. (1980): An Outline of Statistical Theory, Vol. 2, 6th revised edition, World Press, Calcutta.
3. Medhi. J. (1998) : Parisankhya Bigyan, New Age International (P) Ltd.
4. Choudhury, L. (2000) : Prambhik Parisankhya Bigyan, Book Land Guwahati

References :

5. Mood A.M., Graybill F.A and Boes D.C. (1974): Introduction to the Theory of Statistics, McGraw Hill.
6. Hogg R.V. and Craig A.T. (1998): Introduction to Mathematical Statistics, Collier Macmillan Press.
7. Rohatgi V.K. and Md. Ehsanes Saleh A.K.(2001): An Introduction to Probability and Statistics, Second Edition, John Wiley Publication

EP-2-STS-306	**PRACTICAL**	CREDIT	L	T	P
		2	0	0	2

Practicals based on the topics of the paper **ET-3-STS-305**

SEMESTER-IV

ET-3-STS-407	**DESIGN OF EXPERIMENTS & SAMPLE SURVEY**	CREDIT	L	T	P

		3	3	0	0

UNIT 1: Analysis of variance, One way classification, Two way classification, Two way classification with m observations per cell, and Statistical analysis.

UNIT 2: Principles of design of experiment, completely randomized design, randomized block design, Latin square design, assumptions, model, hypotheses, least squares estimates of the parameters, and statistical analysis. Factorial experiments: 2^2, 2^3; Confounding in 2^3 factorial experiments (Preliminary Idea).

UNIT 3: Concepts of population and sample, need for sampling, Descriptive and analytical surveys, census and sample survey: Census and Sample Survey- Advantages and Disadvantages. Principal steps in a sample survey, Probability and Non-probability sampling, Errors in sample survey: Sampling and Non-sampling errors. Simple random sampling with and without replacement, Properties of the estimates and their variances.

UNIT 4: Stratified random sampling, its essence, and limitations; Properties of the estimates and their variances. Allocation: Optimum and Proportional allocation; Variance of the sample stimates, Relative precision of stratified random and simple random sampling.

Systematic sampling: Definition - Variances of the estimated mean, Populations with linear trend (only formula).

Text Books :

1. Gupta S.C. and Kapoor V.K. (2001): Fundamentals of Applied Statistics, Sultan Chand & Sons.
2. Goon A.M, Gupta M.K., Das Gupta B. (1991): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
3. Medhi. J. (1998) : Parisankhya Bigyan, New Age International (P) Ltd.
4. Choudhury, L. (2000) : Prambhik Parisankhya Bigyan, Book Land Guwahati

References :

5. Singh Daroga and Choudhary F.S. (1986), Theory and analysis of Sample Survey Designs, Wiley Eastern Ltd.
6. Montgomery D.C.(2001): Design and Analysis of Experiments, John Wiley.
7. Cochran W.G. (1999), Sampling Techniques, Wiley Eastern Ltd.
8. Des Raj (2000) : Sample Survey, Narosa
9. Agarwala, A.K. & Chakraborty, S. (2009) : Statistics : A tutorial text with practicals, Kalyani Publisher
10. Das.M.N and Giri.N.C(1986): Design and Analysis of Experiments, Wiley Eastern Limited.
11. Mukherjee P (….) : Theory and Methods of Survey Sampling, Prentice Hall of India

EP-2-STS-408	PRACTICAL	CREDIT	L	T	P
		2	3	0	2

Practicals based on the topics of the paper **ET-3-STS-407**

SEMESTER-V

ET-3-STS-509	APPLIED STATISTICS-I	CREDIT	L	T	P
		4	3	1	0

UNIT 1: Time series, components of a time series. Evaluation of trend by least squares and methods of moving averages. Seasonal indices: Simple average, Ratio to moving average Ratio to trend and link relative method.

UNIT 2: Demand Analysis, theory and analysis of consumer's demand, Law of demand, Price elasticity of demand and different forms of demand functions, estimation of demand curves.

UNIT 3: Introduction to Categorical Data : Consistency of categorical data. Independence and association of categorical variables. Various measures of association for two-way data.

EP-2-STS-510	PRACTICAL	CREDIT	L	T	P
		3	2	0	3

Practicals based on the topics of the paper **ET-3-STS-509**

SEMESTER-VI

ET-3-STS-611	APPLIED STATISTICS II	CREDIT	L	T	P
		4	3	1	0

UNIT 1. Sources of demographic data in India: census, vital events, registration, survey. Measures of mortality: crude and specific rates (w.r.t. age, sex, infant mortality rate), Direct and indirect standardization of death rates. Complete life table, structure, interrelationship among life functions, uses of life table. Measures of fertility: CBR ASFR, GFR & TFR. Measures of growth : GRR & NRR

UNIT 2. Statistical Process control: General theory of control charts, Causes of variation in quality, control limits, sub grouping, summary of out of control criteria. Charts for attributes: p- chart, np-chart, c-chart. Charts for variables: $\bar{x}$ & R and $\bar{x}$ & s charts. Acceptance sampling by attribute (single sampling)

Text Books :

1. Goon A.M, Gupta M.K., Das Gupta B. (1991): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
2. Kapoor V.K. and Gupta S.C. (1978): Fundamentals of Applied Statistics, Sultan Chand and Sons.
3. Medhi. J. (1998) : Parisankhya Bigyan, New Age International (P) Ltd.
4. Choudhury, L. (2000) : Prambhik Parisankhya Bigyan, Book Land Guwahati

References :

5. Croxton F.E, Cowden D.J and Kelin S (1973): Applied General Statistics, Prentice Hall of India.
6. Grant E.L. (1964) : Statistical Quality Control, McGraw Hill
7. Duncan A.J. (1974) : Quality Control and Industrial Statistics, Taraporewalla & Sons

8. Mukherjee P (1999): Applied Statistics, New Central Book Agency Pvt. Ltd., Calcutta.
9. Montgomery D.C. (2001) : Introduction to Statistical Quality Control, Wiley

EP-2-STS-511	PRACTICAL	CREDIT	L	T	P
		3	2	0	3

Practicals based on the topics of the paper **ET-3-STS-510**