

BHAVNAGAR UNIVERSITY

BHAVNAGAR

(NACC Accreditation Grade “B”)

CREDIT AND SEMESTER SYSTEM

SYLLABUS

BACHELOR OF SCIENCE (B.Sc.)

STATISTICS

(In Force From Academic Year: 2011-2012)

तमसो मा ज्योतिर्गमय



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: STATISTICS

SEMESTER: 3rd

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	PERIODS PER WEEK	CREDITS
1	ST-301	Mathematical Statistics – I	70 + 30* = 100	28 + 12 = 40	15 weeks x 03 hours = 45	03	03
2	ST-302	Applied Statistics – I	70 + 30* = 100	28 + 12 = 40	15 weeks x 03 hours = 45	03	03
3	ST-303	Quantitative Analysis	70 + 30* = 100	28 + 12 = 40	15 weeks x 03 hours = 45	03	03
4	ST-304	Practicals in Statistics-ABC	90 + 00 = 90 (External Only)	36 + 00 + 36	15 weeks x 09 hours = 135	09	09

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10

1. In a week, there will be three theory periods each of one hour's duration for direct classroom teaching of each of courses ST–301, ST–302 and ST–303.
2. In a week, there will be three laboratory sessions each of three hours' duration for conduction of course ST–304.
3. *Course ST -304 consists of three Sections A, B, C of practicals in statistics designed to make students proficient in real life applications of some statistical methods.
4. There will be three Semester-End Practical Examination papers each of three hours' duration and every written practical paper carries 40 marks.
5. There will be a Viva-voce Examination and Journal Assessment Session of three hours duration at the end of three written Practical Papers for every practical batch. The Viva-voce and Journal Assessment will carry 30 marks.



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: STATISTICS

SEMESTER: 4th

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	PERIODS PER WEEK	CREDITS
1	ST-401	Mathematical Statistics – II	70 + 30* = 100	28 + 12 = 40	15 weeks x 03 hours = 45	03	03
2	ST-402	Applied Statistics – II	70 + 30* = 100	28 + 12 = 40	15 weeks x 03 hours = 45	03	03
3	ST-403	Sampling Methods and Introductory Demography	70 + 30* = 100	28 + 12 = 40	15 weeks x 03 hours = 45	03	03
4	ST-404	Practicals in Statistics-DEF	90 + 00 = 90 (External Only)	36 + 00 + 36	15 weeks x 09 hours = 135	09	09

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10

6. In a week, there will be three theory periods each of one hour's duration for direct classroom teaching of each of courses ST-401, ST-402 and ST-403.
7. In a week, there will be three laboratory sessions each of three hours' duration for conduction of course ST-404.
8. *Course ST -404 consists of three Sections D, E, F of practicals in statistics designed to make students proficient in real life applications of some statistical methods.
9. There will be three Semester-End written Practical Examination papers each of three hours' duration and every written practical paper carries 40 marks.
10. There will be a Viva-voce Examination and Journal Assessment Session of three hours duration at the end of three written Practical Papers for every practical batch. The Viva-voce and Journal Assessment will carry 30 marks.



B.Sc. (STATISTICS)
SEMESTER – III

Modern syllabus for second year B.Sc. (Statistics) confirming to New Credit and Continuous Internal Evaluation Based Semester Pattern proposed to take effect from June 2011.

INTRODUCTION:

Commencing from the academic year 2010-11, the entrant-students to the B.Sc. degree course with a total three years' span would study in aggregate six semesters earmarked for the course. They would be examined internally during and externally at the end of every semester.

The proposed syllabus for B.Sc. Semester III and semester IV students who offer Statistics as either principal or as a subsidiary subject upon their admission in semester III along with the weekly distribution of periods each of one hour's duration and the distribution of marks at Internal and External Evaluation are presented below. The proposed syllabus and pattern are designed to be effective from June 2011.



B.Sc. (STATISTICS)
SEMESTER – III

Paper No. ST-301: Mathematical Statistics – I:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Probability (1)</u> Experiment, Random Experiment, outcomes, Sample Space (finite and infinite), Sample points, Event, concept of occurrence and non-occurrence of an event, compound event, sure event, impossible event, equally likely outcomes of a random experiment Union and intersection of two or more events, Representation of sample space and events by Venn diagram, classical definition of probability, counting principles, examples of probability relative frequency approach to probability with its applications Algebra(field) of events.	[09 P]	15
Unit – II	<u>Probability (2)</u> Axiomatic definition of probability, example showing allocation of probability, Following Results with Proof. i. $P(\Phi) = 0$ ii. $P(A') = 1 - P(A)$ iii. $A \subseteq B \implies P(A) \leq P(B)$ and $A \subset B \implies P(B-A) = P(B) - P(A)$ iv. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ v. Special Addition rule of Probability vi. $P(\cup_{i=1}^k A_i) \leq \sum_{i=1}^k P(A_i)$ Conditional probability, Multiplication theorem of probability, independence of two events, Pair wise and mutual independence of three events, partition of a sample space, Baye's theorem with proof examples and problems, objective questions.	[16 P]	25
Unit – III	<u>Discrete and continuous Random Variables:</u> Concept of a random variable, discrete random variable and its probability distribution, Probability mass function and its properties, cumulative distribution function with properties. Probability Histogram, examples. Idea of a continuous type of variable, Probability density function, difference between discrete probability function and continuous probability density function, examples. Expectation of a random variable, Addition and multiplication theorem of expectation with proof, properties of expectation, Expectation of a function of a random variable, Mean, standard deviation, Raw moments, central moments, expression of r^{th} order central moment in terms of raw moments, moment generating function and its properties (with proof) and related examples.	[20 P]	30



	<p>i. $M_x(t) = \sum_{r=0}^{\infty} \mu_r' \frac{t^r}{r!}$</p> <p>ii. Given C is a constant, $M_{cx}(t) = M_x(ct)$</p> <p>iii. Given X and Y are independent random variables, $M_{x+y}(t) = M_x(t) M_y(t)$.</p> <p>Cumulant generating function ,expression of first four cumulant in terms of moments ,idea of p^{th} quantile , median and inter-quartile range ,examples</p>		
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Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Test	10 Marks
3. Seminar	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Mathematical Statistics with Applications (2nd Ed.): John E. Freund's, Irvin Miller, Maryless Miller Pearson Education
2. Introduction to Mathematical Statistics: Hogg R.V. and Craig A.T. MacMillan Pub.Co.
3. Introduction to Probability Theory: Hoel P. Prot S.C. and Stone C.J. Houghton Mifflin Company Boston
4. Probability & Statistics: Theory and Applications: Fraser D.A.S. North Scituate Mass. Duxbury Press.
5. Fundamentals of Mathematical Statistics: Gupta & Kapoor Sultan Chand Pub. New Delhi
6. Introduction to the Theory of Statistics: Mood A.M., Graybill F.A. and Boes F.A. McGraw Hill Pub.
7. Mathematical Statistics: John E. Freund and Ronald E Walpole Prentice Hall Pub
8. Statistics Made Simple: Do it yourself on PC: K.V.S. Sharma Prentice Hall Pub
9. Introduction to Probability & Statistical Applications: Mayer P.N. Addison Wesley Pub. Co. Massachusetts



Paper No. ST-302: Applied Statistics – I:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Index Numbers:</u> 1.1 Definition and Meaning of Index Number 1.2 Uses of Index Numbers. 1.3 Classification of Index Numbers. 1.4 Steps in the construction of Index Numbers. 1.5 Methods of constructing Index Numbers: 1.6 Simple Aggregative Method, Average of Price Relatives Method (Arithmetic Mean & Geometric Mean), Weighted Aggregative Methods- Laspeyre's, Paasche's, Fisher's, Marshal-Edgeworth's, Dorbish- Bowley's, Walsh's Methods. 1.7 Quantity Index Numbers and Value Index Numbers. 1.8 Tests of Perfection or Consistency of Index Numbers- Time Reversal Test and Factor Reversal Test. 1.9 Fixed Base and Chain Base Index Numbers. 1.10 Results on Index Numbers ($L < F < P$; $L < ME < P$) 1.11 Cost of Living / Consumer's Price Index Numbers. 1.12 Steps in construction of Cost of Living Index Number. 1.13 Methods of constructing Cost of Living Index Number: Aggregate Expenditure Method, Family Budget Method. 1.14 Simple examples based on above topics.	[15 P]	24
Unit – II	<u>Time Series Analysis:</u> 2.1. Meaning and Definition of Time Series 2.2. Components of Time Series- Secular Trend, Periodic Changes, Irregular or Random Component. 2.3. Models of Decomposition of Time Series – Additive Model, Multiplicative Model and Mixed models 2.4. Uses of Time Series 2.5. Estimation of Components:- 2.5.1. Methods of Measurement of Trend: Graphical Method, Method of Semi-Averages, Least Squares method and Method of Moving Averages with determination of the period of moving average. Comparison of these methods. 2.5.2. Methods of Measuring Seasonal Variations: Simple Average Method, Ratio to Trend Method, Ratio to Moving Average Method. 2.6. Simple Examples based on Trend analysis and Seasonal Variation.	[15 P]	23



Unit – III	<u>Indian Official Statistics and Demand Analysis:</u>	[15 P]	23
	3.1 Central Statistical Organization		
	3.2 National Sample Surveys Organization		
	3.3 Population Census- De-Facto and De Jure Method		
	3.4 Economic Census		
	3.5 Agriculture Statistics		
	3.6 National Income Statistics		
	3.7 Methods of Estimation of National Income		
	3.8 Meaning of Demand and Supply , Law of Demand and Supply, Market Equilibrium, Equilibrium Price and quantity, Elasticity of Demand & Supply		

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Test	10 Marks
3. Seminar	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Business Statistics - M.P. Gupta & S. P. Gupta Sultan Chand Pub. New Delhi
2. Fundamentals of Applied Statistics-S.C. Gupta & V.K. Kapoor. Sultan hand Pub. New Delhi
3. Basic Statistics - B. L. Agrawal New Age International Publication
4. Indian Official Statistical Systems - Saluja M.R. Statistical Pub. Society and Indian Econometric Society
5. Guide to Current Indian Official Statistics - Central Statistical Organization Govt. of India



Paper No. ST-303: Quantitative Analysis:

Credit: 03**Total Marks: 100****Marks: Semester End Examination: 70****Continues Internal Evaluation: 30**

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Operations Research & Linear Programming Problems:</u> Meaning and Definition of Operations research, Advantages of O.R., Applications and Scope of O.R. Linear Programming Problem(L.P.P.) – General structure of L.P.P., Assumption of L.P.P., Graphical method of solving L.P.P., concept of slack variable, feasible solution, basic solution, basic feasible solution, optimal solution and degenerate solution. Simplex method of solving L.P.P.(Only two decision variable case)	[15 P]	24
Unit – II	<u>Game Theory:</u> Concept of Game, player, strategy, two-person zero sum game, saddle point, mini-max & maxi-min principles, rules for saddle point. Game without saddle point: Mixed strategies game, principle of Dominance, Algebraic method of solving game, graphical method of solving game, Simple examples.	[15 P]	23
Unit – III	<u>Decision Theory: Decision alternatives, State of nature, Pay off:</u> 1. Types of Decision making: o Decision making under certainty o Decision making under risk o Decision making under uncertainty 2. Decision making under uncertainty: o Maxi-min or Mini-min criteria, Harwich criteria of realism, maxi-min or mini-max criteria, Criteria of regret, Laplace or equally likely criteria, Simple Examples. 3. Decision under Risk: o Expected Monetary Value (EMV) o Expected Opportunity Loss (EOL) criteria & examples.	[15 P]	23

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Test	10 Marks
3. Seminar	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Linear Programming G. Hadley
2. Fundamentals of Applied Statistics- S.C. Gupta & V.K. Kapoor Sultan Chand Pub. New Delhi
3. Operations Research - J. K. Sharma, Macmilan Publication, N.D.
4. Linear Programming and Theory of Games (9th Ed.) P.K. Gupta and Manmohan Sultan Chand Pub. New Delhi
5. Optimization Techniques – Mohan Chander & Deep Kusum, New Age International
6. Introduction to Operations Research: Kanti Swrup, P.K. Gupta And Manmohan Sultan Chand Pub. New Delhi
7. Quantitative Techniques in Management N.D. Vohra, Tata McGraw Hill Pub
8. Operation Research- An Introduction Taha Prentice Hall Pub



Paper No. ST-304: Practicals in Statistics–ABC:

Credit: 09

Total Marks: 90 (External Only)

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
SECTION – A			
1	Construction of: 1 Single valued and 2 Group frequency Distribution with inclusive and exclusive classes, and drawing histogram in each case, Stem-and-Leaf diagram.	[1 PR]	
2	Graphical presentation of data by: 1 Frequency Polygon 2 Frequency Curve 3 Relative Frequency Polygon 4 Histogram and Frequency Polygon on the same graph and 5 Ogive Curve for frequency distribution with equal length classes [inclusive and exclusive]	[2 PR]	
3	Tabulation, simple and complex types: ♣ Cross classification and construction of bivariate frequency tables.	[1 PR]	
4	Computation and interpretation of measures of central tendency and positional measures such as quartiles, Deciles, Percentiles [for ungrouped and grouped data] and idea of percentiles rank. Tracing quartiles from Ogive curve.	[2 PR]	
5	Computation and interpretation of absolute measures of dispersion: 1 Range 2 Inter-quartile Range 3 Quartile Deviation 4 Mean Deviation 5 Standard Deviation and relative measures based on them for ungrouped and grouped data, potential outliers in raw data, Box plot.	[2 PR]	
6	Computation of raw moments and central moments of first four order, skewness coefficient $\sqrt{\beta_1}$ and kurtosis coefficient β_2 and interpretation of types of skewness as well as i. $\beta_2 = 3$ ii. $\beta_2 > 3$ iii. $\beta_2 < 3$.	[1 PR]	
SECTION – B			
1	Construction of Index Number (Un-weighted)	[1 PR]	
2	Construction of Index Number (Weighted)	[1 PR]	
3	Test of Reversibility, T.R.T. & F.R.T.	[1 PR]	
4	Fixed Base and Chain Base Index Number	[1 PR]	
5	Measurement of Trend – I (Graphical method & method of semi-average)	[1 PR]	
6	Measurement of Trend – II (Method of Least Squares & Moving Average method)	[1 PR]	



7	Measurement of Seasonal Variation – I (Ratio to Trend method)	[1 PR]	
8	Measurement of Seasonal Variation – II (Ratio to Moving Average)	[1 PR]	
9	Link Relatives method for computing Seasonal Indices.	[1 PR]	
10	Applications of Demand Analysis.	[1 PR]	
SECTION – C			
1	Formulation of Linear Programming Problems.	[1 PR]	
2	Graphical Method of Solving L.P.P.	[1 PR]	
3	Simplex Method of Solving L.P.P.	[1 PR]	
4	Solving a Game with Saddle point.	[1 PR]	
5	Solving a Game with Saddle point –Mini-max Criteria.(2X2 and general case)	[1 PR]	
6	Solving a Game without Saddle point (2X2) – Algebraic Method.	[1 PR]	
7	Solving a Game without Saddle point - Dominance Principle.	[1 PR]	
8	Solving problem of Decision Making under Uncertainty, (Optimism , Pessimism Criteria Laplace Criteria)	[1 PR]	
9	Solving problems of Decision Making under Uncertainty (Hurwitz's & Regret Criteria)	[1 PR]	
10	Solving problems of Decision Making under Risk- EMV. Criteria.	[1 PR]	



B.Sc. (STATISTICS)

SEMESTER – IV

Paper No. ST-401: Mathematical Statistics – II:

Credit: 03

Total Marks: 100

Marks: Semester End Examination: 70

Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p><u>Some Discrete Probability Distributions:</u></p> <p>1.1. Bernoulli Prob. Distribution, Mean, Standard Deviation, MGF, Applications</p> <p>1.2. Binomial Probability Distribution: Suitable conditions for its Application, Derivation of Probability function, Mean, S.D., MGF, CGF, $\sqrt{\beta_1}$, β_2, MGF Recurrence Relation & Central Moments, Additive property, Examples.</p> <p>1.3. Poisson Probability Distribution: Poisson Approximation to binomial Probability Distribution, Definition, real life applications, Mean, S.D., MGF, CGF, equality of all cumulants, $\sqrt{\beta_1}$, β_2, Recurrence Relation of Central Moments, Additive property, Examples.</p>	[16 P]	15
Unit – II	<p><u>Some Continuous Probability Models:</u></p> <p>2.1. Exponential probability Distribution, Nature of Probability Curve, Mean S.D, MGF ,CGF, Lack of memory property, application</p> <p>2.2. Generalized Gamma probability Distribution, Mean, S.D., MGF, CGF, Additive property, The probability distribution of sum of independent exponential variates, applications.</p> <p>2.3. Normal Probability Distribution: Chief Characteristics, MGF, CGF, β_1, β_2, Derivation of expression, $\mu_{2n} = (1)(3)(5)\dots(2n-1) \sigma^{2n}$, Area property applications, examples based on Normal approximation to Binomial and Poisson Distribution.</p>	[16 P]	25
	<p><u>Correlation and Regression Analysis.</u></p> <p>3.1. Linear Correlation, Types of Linear Correlation, Scatter Diagram, correlation not establishing Causation ,Linear coefficient of Correlation, Properties of 'r' given by</p> <ul style="list-style-type: none"> ♣ $-1 \leq r \leq 1$ ♣ r is independent of change of origin and/or change of scale ♣ X and Y are independent random variables implies that rxy but converse does not hold always examples <p>3.2. Meaning of linear Regression, Method of least squares to estimate the regression coefficient and the intercept term, Properties of Regression coefficients, Standard error of estimator $S_{y,x}$ and its interpretation and application. Examples.</p>	[13 P]	20



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Test	10 Marks
3. Seminar	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Mathematical Statistics with Application (2nd Ed.) - John E. Freund's, Irvin Miller, Maryless Miller
Pearson Education
2. Introduction to Mathematical Statistics - Hogg R.V. and Craig A.T. Mac Millan Pub.Co.
3. Introduction to Probability Theory - Hoel P., Prot S.C. and Stone C.J. Houghton Mifflin Company Boston
4. Probability & Statistics: Theory and Applications - Fraser D.A.S. North Scituate Mass. Duxbury Press.
5. Fundamentals of Mathematical Statistics - Gupta & Kapoor Sultan Chand Pub. New Delhi
6. Introduction to the Theory of Statistics - Mood A.M., Graybill F.A. and Boes F.A. McGraw Hill Pub.
7. Mathematical Statistics - John E. Freund and Ronald E Walpole Prentice Hall Pub
8. Statistics Made Simple: Do it yourself on PC K.V.S. Sharma Prentice Hall Pub.
9. Introduction to Probability & Statistical Applications - Mayer P.N. Addison Wesley Pub. Co.
Massachusetts
10. An Introduction to Probability and Statistics - Rohatgi V.K. and Ehsanes Saleh John Wiley



Paper No. ST-402: Applied Statistics – II:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Tests of Significance:</u> ♣ Population, Sample, Parameter, Statistic, Sampling distribution & Standard Error of test Statistic, Hypothesis, Statistical hypothesis. Null and Alternative Hypotheses, Simple and Composite Hypotheses. Critical Region, Types I and Type II Error. Level of Significance, Criteria for testing a hypothesis. ♣ Large Sample Tests: Single Mean, Difference of two Means, Single Proportion, Difference of two Proportions. using ○ Critical region Approach and ○ p – value approach ♣ Examples.	[15 P]	24
Unit – II	<u>χ^2- Test</u> ♣ Goodness of Fit Test ♣ Independence of attribute Test [r x s –Contingency Table, 2X2 C.T.] ♣ Test of Single Population Variance. ♣ Yates continuity corrections for 2x2 C.T. ♣ Examples: ♣ t- Test: ♣ Single Population Mean ♣ Significance of difference in Means of Two Normal populations having equal variances ♣ Paired t-Test ♣ Examples ♣ F- Test: ♣ Significance of difference of variances of two Normal populations ♣ One Way and Two Way ANOVA Technique ♣ Examples	[15 P]	23
Unit – III	<u>Theory of Attributes:</u> ♣ Concept of attribute, Notations, dichotomy, ♣ Class frequency, order of classes, positive class frequency, negative class frequency. ♣ Relation between class frequencies. ♣ Class Symbols as Operators and Examples. ♣ Consistency of Data, conditions for consistency of Data. ♣ Independence of Attributes, Criterion of Attributes. ♣ Yule’s coefficient of association (Q). ♣ Properties of Q and Interpretation of Q. ♣ Examples and problems.	[15 P]	23



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Test	10 Marks
3. Seminar	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Fundamental of Statistics, Vol.II - A.M.Goon, M.K. Gupta & B. Dasgupta World Press Pvt.Ltd
2. Fundamentals of Mathematical Statistics - S.C. Gupta & V.K. Kapoor Sultan Chand Pub. New Delhi
3. Basic Statistics- B. L. Agrawal New Age International Publication
4. Applied Statistics- Mukhopadhyay Parimal New Central Book Agency Kolkota
5. Statistics–Theory, Methods and Applications-D.C. Sancheti, V.K.Kapoor Sultan Chand & sons NewDelhi
6. Business Statistics - G.U. Shenoy, U.K.Shrivastava, S.C.Sharma Wiley Eastern Pub.



Paper No. ST-403: Sampling Methods and Introductory Demography:

Credit: 03

Total Marks: 100

Marks: Semester End Examination: 70

Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p><u>Introduction to Sampling Methods:</u></p> <ul style="list-style-type: none"> ♣ Population (Finite and Infinite), Variable and Attribute, Need for Sampling, Target and Sampled Population, Probability and Non-Probability Sampling, Sampling Frame, Sampling and Non Sampling Errors, General Introduction to Some Methods of Probability Sampling 1. Simple Random Sampling (With and Without Replacement) 2. Systematic Sampling 3. Circular Systematic Sampling 4. Stratified Sampling 5. Two Stage Sampling 	[15 P]	24
Unit – II	<p><u>Simple Random Sampling Without Replacement (SRSWOR):</u> Definition, Procedures to select a SRS using</p> <ol style="list-style-type: none"> 1. Random Numbers Table 2. MS Excel <ul style="list-style-type: none"> ♣ Suitability of SRS ♣ To Prove following Results 1. $E(\bar{y}) = \bar{Y}$ 2. $V(\bar{y})_{SRSWOR} = \frac{N-n}{N} \frac{s^2}{n} = \frac{N-n}{N-1} \frac{s^2}{n}$ $V(\bar{Y})_{SRSWOR} = N^2 (1-f) \frac{s^2}{n}$ 3. $E(s^2) = S^2$ <ul style="list-style-type: none"> ♣ Unbiased estimators of $SE(\bar{y})$ and $SE(\bar{Y})$ ♣ Idea of Sampling Fraction and Finite Population Correction ♣ Examples ♣ Advantages and Disadvantages of SRS. 	[15 P]	23
Unit – III	<p><u>Introductory Demography:</u></p> <ul style="list-style-type: none"> ♣ Vital Events, Vital Statistics, Methods of Obtaining Vital statistics-Census and Vital Statistics Registers. ♣ Rates of Vital Events, Mortality Rates, CDR, Specific (age,sex etc.) death Rates. Standardized death Rate (Direct and Indirect Methods), Infant Mortality Rate. ♣ Complete and Abridged Life Tables, Functions of the Life Table and their inter relationships, Construction of Life tables. ♣ Fertility Rates: CBR, GFR, ASFRs and TFR and their interpretation. 	[15 P]	23



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Test	10 Marks
3. Seminar	<u>10 Marks</u>
Total Marks	30 Marks

Reference / Text- Books/ Additional Reading:

1. Sampling Techniques - W.G. Cochran Wiley Eastern Ltd
2. Fundamentals of Mathematical Statistics - S.C. Gupta & V.K. Kapoor Sultan Chand Pub. New Delhi
3. Theory of Sample Surveys - Parimal Mukhopadhyay Prentice Hall Pub.
4. Theory and Analysis of Sample Survey Design - Daroga sigh and Chaudhry Wiley Eastern Ltd.
5. Demography - P.R.Cox
6. Fundamental of Statistics, Vol.II - A.M.Goon, M.K. Gupta & B. Dasgupta World Press Pvt. Ltd.
7. Introduction to Bio Statistics and Research methods - Sunder Rao and J. Richard Prentice Hall Pub
8. Basic Statistics - B. L. Agrawal New Age International Publication.
9. Statistics–Theory, Methods and Applications-D.C. Sancheti, V.K.Kapoor Sultan Chand & sons New Delhi
10. Business Statistics-G.U.Shenoy, U.K. Shrivastava, S.C. Sharma Wiley Eastern Pub.



Paper No. ST-404: Practicals in Statistics–DEF:

Credit: 09

Total Marks: 90 (External Only)

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
SECTION – D			
1	Applications of Bernoulli and Binomial Probability Distribution.	[1 Pr]	
2	Applications of Poisson Probability Distribution.	[1 Pr]	
3	Fitting of a Binomial Probability Distribution.	[1 Pr]	
4	Fitting of Poisson Probability Distribution.	[1 Pr]	
5	Application of Normal Probability distribution directly and also as approximation to Binomial and probability distributions.	[1 Pr]	
6	Fitting of a Normal Probability distribution.	[1 Pr]	
7	Lines of Regression and Coefficient of Correlation.	[2 Pr]	
8	Rank Correlation Coefficient.	[1 Pr]	
SECTION –E			
1	Large Sample Tests-I Single Mean & Difference of two Means	[1 Pr]	
2	Large Sample Tests-II (Single Proportion, Difference of two Proportions)	[1 Pr]	
3	χ^2 - Test - Goodness of Fit Test,	[1 Pr]	
4	χ^2 - Test - Independence of attributes [r x s –Contingency Table, 2X2 C.T.],	[1 Pr]	
5	χ^2 - Test –Applications (Single Population Variance, Yates continuity correction)	[1 Pr]	
6	t- Test – (Single Population Mean, Difference of two Means)	[1 Pr]	
7	Paired t-Test	[1 Pr]	
8	Analysis of Variance -One way classified data.	[1 Pr]	
9	Analysis of Variance -Two way classified data	[1 Pr]	
10	Yule’s coefficient of association (Q).	[1 Pr]	
SECTION – F			
1	Selection of a SRS (WR and WOR) and Systematic Sample	[2 Pr]	
2	Verification of Important Results of SRSWOR	[1 Pr]	
3	Estimation of Population Mean ,Population Total and Standard Errors of their Estimators in case of SRSWOR	[2 Pr]	
4	Measurement of Mortality	[1 Pr]	
5	Measurement of Fertility	[1 Pr]	
6	Interrelationships of Functions of Complete and Abridged Life Tables	[1 Pr]	
7	Construction of Life Table-Complete and Abridged	[1 Pr]	