Sri Dev Suman Uttarakhand University
Badshahithaul, Tehri Garhwal

B.A./ B.Sc. Statistics Syllabus-2019-20

Courses in the B.A./B.Sc. Programme at a Glance

First Year

Course Code	Title of the Paper
STAT/C-101	Statistical Methods and Applied Statistics
STAT/C-102	Probability Theory And Theoretical Distributions
STAT/C-103	Statistical Inference
STAT/P-104	Practical

Second Year

Course Code	Title of the Paper
STAT/C-201	Numerical Analysis, Computer Intensives And Operation Research
STAT/C-202	Sampling Theory
STAT/C-203	Testing of Significance
STAT/P-204	Practical

Third Year

Course Code	Title of the Paper
STAT/C-301	Analysis of Variance & Design of Experiments
STAT/C-302	Theory of Attributes And Quality Control
STAT/C-303	Population Studies
STAT/P-304	Practical

Course Code: STAT/C-101
Title: Statistical Methods and Applied Statistics
Maximum Marks: 50

Unit 1

Introduction: Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines. Statistical organization in India and their functions: CSO, ISI, IIPS, Bureau of Economics and Statistics. Presentation of data: Construction of tables with one or more factors of classification, diagrammatic representations, frequency distributions and cumulative frequency distributions and their graphical representations.

Measures of Central tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean: their properties. Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and their properties, Coefficient of Variation, Moments, Skewness and Kurtosis.

Unit 2: : Simple correlation, Karl Pearson's coefficient of correlation, Rank Correlation, Regression. line of regression, Curve Fitting: Principle of least squares, fitting of straight line, second degree parabola and exponential curves.

Unit 3: Time Series: Introduction, Examples of time series from various fields, components of a time series, Additive and Multiplicative models, Determination of trend by different methods, Determination of seasonal variation by ratio to trend, ratio to MA and link relative methods. Index Numbers: Price, Quantity and Value Indices.

Unit 4: Price Index Numbers: Construction, uses, limitations, tests for index numbers, various formulae and their comparisons, chain index number. Some important indices: Consumer price index, wholesale price index and index of industrial production – methods of construction and uses.

Books Recommended

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th Ed., Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta, Fundamentals of Statistics, Vol I, 8th Ed., World Press, Kolkatta, 2005.
3. M. Ray, H.S. Sharma and Sanjay Chaudhary, Mathematical Statistics, Ram Prasad & Sons
4. J.E. Freund, Mathematical Statistics with Applications, 7th Ed., Pearson Education, 2009
5. Powker A. H. & Goode: sampling instruction variables (Mc Graw Hill)

Course Code: STAT/C-102
Title: Probability Theory And Theoretical Distributions
Maximum Marks: 50

Unit 1:
Random Experiment: Trial, Sample point, Sample spaces, different types of events.
Definition of probability: Classical, Statistical and Axiomatic approach to probability.
Probability of union and intersection of events, Conditional probability and
Independence of events, Baye's Theorem and its applications. Examples based on
classical approach and repeated trials.

Unit 2: Random Variables: Definition of discrete and continuous random variables,
cumulative distribution function (c.d.f.) and its properties (with proof), probability mass
function (p.m.f.) and probability density function (p.d.f.),

Unit 3: Mathematical expectation of random variables, its properties and applications.

Unit 4: Distributions: Bernoulli, Binomial, Poisson distribution, Normal Distribution.

Books Recommended

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, 11th Ed.,
   Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta: Fundamentals of Statistics, Vol I, 8th
   Ed., World Press, Kolkatta, 2005.
3. M. Ray, H.S. Sharma and Sanjay Chaudhary: Mathematical Statistics, Ram
   Prasad & Sons
4. R.V. Hogg, A.T. Craig and J.W. Mckean: Introduction to Mathematical
   Statistics, 6th Ed., Pearson Education, 2005
5. A.M. Gupta, M.K. Gupta and B. Dasgupta: An Outline of Statistical Theory
   (Vol I), 4th Ed., World Press, Kolkata, 2003

Course Code: STAT/C-103
Title: Statistical Inference

Maximum Marks: 50

Unit 1:

Idea of Inference- Point and Interval Estimations

Unit 2:

Point Estimation: Requirements of a good estimator- notions of Mean Square Error, Unbiasedness: Minimum Variance Unbiasedness and Best Linear Unbiasedness, Sufficiency. Factorization Theorem (Discrete case only), Properties of Minimum variance unbiased estimators, consistent estimators and asymptotic efficiency, Cramer-Rao lower bound, Rao-Blackwell Theorem.

Unit 3:

Methods of Estimation- Moment, Least- Square, Maximum Likelihood and Minimum Chi-Square Methods and their properties (excluding proofs of large sample properties).

Unit 4:

Hypothesis Testing: Basic concept, Simple and composite hypothesis, Two types of error, power of the test , Neyman-Pearson lemma and its generalization, Types A, A1, critical regions, Construction of most powerful test, Uniformly most powerful tests, Uniformly most powerful Unbiased test using N P lemma, likelihood ratio test and its properties.
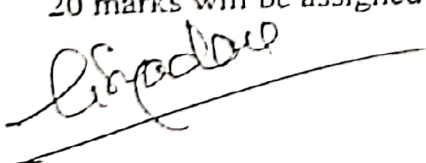
Books Recommended

1. Mood, Urayabill and Boes: introduction of the Theory of Statistics (McGraw Hill)
2. Wilks, S.S: Mathematical Statistics (John Wiley)
3. Kendall, M.G. & Stuart A: Advanced Theory of Statistics Vol. II
4. Goon, Gupta & Das Gupta : An outline Statistical Theory Vol. II

Course Code: STAT/P-104

Practical based on papers C-101 ,C- 102 and C-103.
Practical will be of 50 marks out of which 30 marks will be written practical exam and 20 marks will be assigned each on practical annual record and viva-voce.

Course Code: STAT/C-201

Title: Numerical Analysis, Computer Intensives And Operation Research

Maximum Marks: 50

Unit 1:
Numerical Analysis: Calculus of finite differences, Operators, Separation of symbols, Examples and problems. Interpolation: Interpolation for equal and unequal intervals, Newton's forward and backward formulae. Central difference formulae, Newton's divided difference formula for interpolation. Lagrange's interpolation formula, Stirling's and Bessel's formulae- Derivations and Problems.

Unit 2: Numerical Integration: Derivation of general quadrature formula for equidistant ordinates. Derivation of Trapezoidal, Simpson's $1\backslash3^{rd}$ and $3\backslash8^{th}$ rules. Weddle's rule (without proof). What is computer, characteristics of Computer, Applications of Computer and its limitation, Data Information, Number System (Binary, Octal, Hexadecimal), Binary Arithmetic.

Unit 3: Definition and scope of Operational research; phases in Operations Research; models and their solutions. Linear Programming, formulation and graphical solutions.

Unit 4: Decision Theory: Elements of Decision theory, decision making under conditions of certainty, decision making under conditions of uncertainty, EMV and EOL criteria, EVPI and EPPI.

Books Recommended

1. Lodge, H. F & Romming: Sampling inspection Plans and Tables (John Wiley)
2. Kendall, M.G. & Stuart A.: Advanced theory of Statistics. Vol. III (Charies Griffin)
3. S.C. Srivastava: Studies in Demography. Anmol Publication Pvt Ltd.
4. S.C. Gupta & V.K. Kapoor: Fundamental of Applied Statistics. S. Chand & Sons
5. Burdan, Faires Burdan: Numerical Analysis
6. S.S. Sastry: Introductory Methods of Numerical Analysis, 5th Ed. Kindle Edition
7. Gupta, R.: Numerical Analysis, Laxmi Publications, New Delhi
8. Biswal, Purna Chandra: Numerical Analysis, 1st Edition, Phi Learning Private Ltd.
9. Churchman, C.W. Acoff and Anoff : Introduction to Operations Research, Wiley chap. 7,7,17.
10. Hamdy A. Taha, Operations Research-An Introduction, Prentice Hall, 8th Edition, 2007

11. Gass, S.I.: Linear Programming, Methods and applications, Mc. Graw Hill
12. Satty, T. L.: Mathematical Methods of Operations Research, Mc. Graw Hill

Course Code: STAT/C-202

Title: Sampling Theory

Maximum Marks: 50

Unit 1:

Introduction: Concepts of finite population and sample, need for sampling, Sampling vs. Complete enumeration.

Unit 2:

General Ideas: Planning and execution of sample surveys, analysis of data and reporting, biases and errors, Simple Random sampling with and without replacement. Use of random number tables in selection of simple random sample.

Unit 3:

Stratified random sampling, Systematic sampling, Judgment and probability sampling schemes.

Unit 4:

Distributions of Order statistics and sample range.

Books Recommended

1. S.C. Gupta, V.K. Kapoor: Fundamental of Applied Statistics, Sultan Chand and Sons
2. Cochran. W. G.: Sampling Techniques, J. Wiley & Sons.
3. Sukhatma & Sukirate: Sampling Theory and it's applications.
4. Mufty: Sampling theory & Methods.

Course Code: STAT/C-203

Title: Testing of Significance

Maximum Marks: 50/50

Unit 1:
Elements of hypothesis testing: Basic concept, Null and Alternative Hypothesis, Simple and composite hypothesis.

Unit 2:
Critical Regions, Two types of error, Level of Significance and size, power of the test, p-value, Tests of significance related to a single Binomial proportion and Poisson parameter.

Unit 3:
Test of Significance: Large sample tests of Mean, Variance, Proportion and correlation coefficient.

Unit 4:
Simple properties of Chi-square, Student-t and Snedecor's F with applications in Test of Significance.

Books Recommended

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, 11th Ed., Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta: Fundamentals of Statistics, Vol I, 8th Ed., World Press, Kolkatta, 2005.
3. M. Ray, H.S. Sharma and Sanjay Chaudhary: Mathematical Statistics, Ram Prasad & Sons
4. Kishore K. Das, Dibyojyoti Bhattacharjee: A Treatise on Statistical Inference & Distribution, Asian Books Private Limited

Course Code: STAT/P-203
Title: Practical
Practical based on C-201, C-202 and C-203.
Practical will be of 50 marks out of which 30 marks will be written practical exam and

20 marks will be assigned each on practical annual record and viva-voce.

B.A./B.Sc. III Year

Course Code: STAT/C-301

Title: Analysis of Variance and Design of Experiments

Maximum Marks: 50

Unit 1:

Introduction : Heterogeneity and Analysis of Variance. One way classification and Two way classification

Unit 2:

Principles of design of experiments: Replication Randomization and Local control. Uniformity Trials, Shapes and Sizes of Plots and Blocks.

Unit 3:

Completely randomized design- Layout, Statistical Analysis and Efficiency Comparisons with other designs, Randomized Block Design- Layout, Statistical Analysis and Efficiency Comparisons with other designs and Latin Square Design Layout, Statistical Analysis and Efficiency Comparisons with other designs.

Unit 4:

Missing plot techniques-Analysis of Designs with missing Observations.

Books Recommended:

1. D.C. Montgomery: Designs and Analysis of Experiments, John Wiley and Sons, New York, 2001
2. S.C. Gupta, V.K. Kapoor: Fundamental of Applied Statistics, Sultan Chand and Sons
3. M.N. Das and N.C. Giri: Design and Analysis of Experiment, Wiley Eastern Limited, New Delhi
4. Angela Dean, Daniel Voss & Danel Draguljic: Design and Analysis of Experiments, Springer

Course Code: STAT/C-302
Title: Theory of Attributes and Quality Control
Maximum Marks: 50

Unit 1:
Theory of Attributes- Notion and terminology, Classes and class frequencies, Order of Classes and Class frequencies, Relation between class frequencies, Consistency of data, contingency table, Conditions for consistency of data. Independence of Attributes, Criterion for Independence,

Unit 2: Association of attributes, Measure of association. Calculation of Chi-square. Introduction: Concepts of quality and quality control, process control and product control.

Unit 3: Process Control: Control charts and their uses, choice of subgroup sizes, construction of control charts by variables (, R and S.D. charts) and by attributes (p, c and np charts).
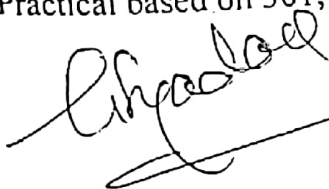
Unit 4:
Product Control: Producer's Risk, Consumer's Risk, Acceptance Sampling Plan, Single and Double sampling plans by attributes, their OC, ASN, ATI, LTPD, and AOQL. Single sampling plan for inspection by variables (One-sided specification, known and unknown σ cases).

Course Code: STAT/P-303

Title: Practical

Maximum Marks: 50/ 50

Practical based on 301, 302 and 303.

Course Code: STAT/C-303

Title: Population Statistics

Maximum Marks: 50

Unit 1:

Introduction: Sources of Population data- Census data, Registration data and errors in such data, Rates and Ratios of vital events.

Unit 2:

Measurements of Mortality: Crude Death Rate, Specific Death Rate, Standardized Death Rate, Infant Mortality Rate, Life Table: Construction, Types and Uses.

Unit 3:

Measurements of Fertility: Crude Birth Rate, General Fertility Rate, Age-Specific Fertility Rate, Total Fertility Rate.

Unit 4:

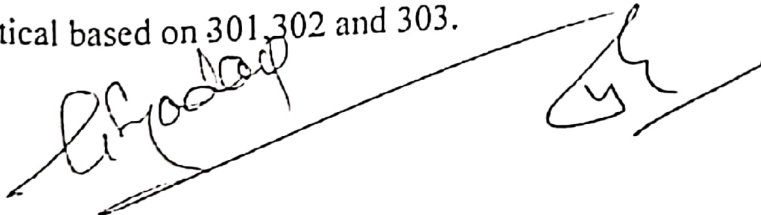Measurement of Population Growth: Crude Rate of Natural Increase and Vital Index, GRR and NRR.

Books Recommended

1. S.C. Srivastava: Studies in Demography, Anmol Publication Pvt. Ltd.
2. S.C. Gupta, V.K. Kapoor; Fundamental of Applied Statistics, Sultan Chand and Sons
3. Asha A. Bhende & Tara Kanitkar: Principles of Population Studies, Himalaya Publishing House
4. D. T. Rowland: Demographic Methods and Concepts, Oxford.

Course Code: STAT/P-304

Title: Practical Maximum Marks: 50

Practical based on 301,302 and 303.