

**Sri Dev Suman Uttarakhand University**  
**Badshahithaul, Tehri Garhwal**

**B.A./ B.Sc. Statistics Syllabus- 2018**

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

**First Semester**

<b>Course Code</b>	<b>Title of the Paper</b>
STAT/C-101	Basic Statistics
STAT/C-102	Probability Theory
STAT/P-103	Practical

**Second Semester**

<b>Course Code</b>	<b>Title of the Paper</b>
STAT/C-201	Statistical Inference
STAT/C-202	Applied Statistics
STAT/P-203	Practical

**Third Semester**

<b>Course Code</b>	<b>Title of the Paper</b>
STAT/C-301	Numerical Analysis & Introduction to Computer
STAT/C-302	Analysis of Variance & Design of Experiments
STAT/P-303	Practical

**Fourth Semester**

<b>Course Code</b>	<b>Title of the Paper</b>
STAT/C-401	Sampling Theory
STAT/C-402	Operations Research
STAT/P-403	Practical

### **Fifth Semester**

<b>Course Code</b>	<b>Title of the Paper</b>
STAT/C-501	Testing of Significance
STAT/C-502	Computational Techniques
STAT/P-503	Practical

### **Sixth Semester**

<b>Course Code</b>	<b>Title of the Paper</b>
STAT/C-601	Theory of Attributes & Quality Control
STAT/C-602	Populations Statistics
STAT/P-603	Practical

## **B.A./ B.Sc. I Semester**

**Course Code: STAT/C-101**

**Title: Basic Statistics**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

### **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.

### **Unit 2**

Measures of Central tendency: Mean, Median, Mode, Geometric Mean and Harmonic Mean: their properties.

### **Unit 3:**

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and their properties, Coefficient of Variation, Moments, Skewness and Kurtosis.

### **Unit 4:**

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.

### **Books Recommended**

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11<sup>th</sup> Ed., Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta, Fundamentals of Statistics, Vol I, 8<sup>th</sup> 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, 7<sup>th</sup> Ed., Pearson Education, 2009

**Course Code: STAT/C-102**

**Title: Probability Theory**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/80**

**(b) Semester/Internal Assessment : 15/20**

**Unit 1:**

Random Experiment: Trial, Sample point, Sample spaces, different types of events.

Definition of probability: Classical, Statistical and Axiomatic approach to probability.

**Unit 2:**

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 3:**

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.), 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, 11<sup>th</sup> Ed., Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta: Fundamentals of Statistics, Vol I, 8<sup>th</sup> 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, 6<sup>th</sup> Ed., Pearson Education, 2005

5. A.M. Gupta, M.K. Gupta and B. Dasgupta: An Outline of Statistical Theory (Vol I), 4<sup>th</sup> Ed., World Press, Kolkata, 2003

**Course Code: STAT/P-103**

**Title: Practical**

**Maximum Marks: 50/ 50**

Practical based on papers 101 and 102.

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. II Semester**

**Course Code: STAT/C-201**

**Title: Statistical Inference**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

#### **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/C-202**

**Title: Applied Statistics**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

### **Unit 1:**

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.

### **Unit 2:**

Index Numbers: Price, Quantity and Value Indices.

### **Unit 3:**

Price Index Numbers: Construction, uses, limitations, tests for index numbers, various formulae and their comparisons, chain index number.

### **Unit 4:**

Some important indices: Consumer price index, wholesale price index and index of industrial production – methods of construction and uses.

### **Books Recommended**

1. Powker A. II. & Goode: sampling instruction variables (Mc Graw Hill)

2. Lodge, H. F & Romming: Sampling inspection Plans and Tables (John Wiley)
3. Kendall, M.G. & Stuart A.: Advanced theory of Statistics. Vol. III (Charles Griffin)
4. S.C. Srivastava: Studies in Demography, Anmol Publication Pvt Ltd.
5. S.C. Gupta & V.K. Kapoor: Fundamental of Applied Statistics, S. Chand & Sons

**Course Code: STAT/P-203**

**Title: Practical**

**Maximum Marks: 50/ 50**

Practical based on 201 and 202.

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 Semester**

**Course Code: STAT/C-301**

**Title: Numerical Analysis and  
Introduction to Computer**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

#### **Unit 1:**

Numerical Analysis: Calculus of finite differences, Operators, Separation of symbols, Examples and problems.

#### **Unit 2:**

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 3:**

Numerical Integration: Derivation of general quadrature formula for equidistant ordinates. Derivation of Trapezoidal, Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules. Weddle's rule (without proof).

**Unit 4:**

What is computer, characteristics of Computer, Applications of Computer and its limitation, Data Information, Number System (Binary, Octal, Hexadecimal), Binary Arithmetic.

**Books Recommended**

1. Burdan, Faires Burdan: Numerical Analysis
2. S.S. Sastry: Introductory Methods of Numerical Analysis, 5<sup>th</sup> Ed. Kindle Edition
3. Gupta, R.: Numerical Analysis, Laxmi Publications, New Delhi
4. Biswal, Purna Chandra: Numerical Analysis, 1<sup>st</sup> Edition, Phi Learning Private Limited

**Course Code: STAT/C-302**

**Title: Analysis of Variance & Design of Experiments**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

**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/P-303****Title: Practical****Maximum Marks: 50/ 50**

Practical based on 301 and 302.

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al 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. IV Semester****Course Code: STAT/C-401****Title: Sampling Theory****Maximum Marks: 75 / 100****(a) Semester Examination: 60/ 80****(b) Semester/Internal Assessment 15/ 20**

**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-402**

**Title: Operations Research**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

**Unit 1:**

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

**Unit 2:**

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.

**Unit 3:**

Game Theory: Zero-sum games, strategies, two-person games, Minimax-Maximin principle, Games with and without saddle points, dominance principle, graphical method of solving games.

**Unit 4:**

Basics of reliability. Classes of life distributions. Series, parallel, configurations. Reliability models, Reliability.

**Books Recommended**

1. Churchman, C.W. Acoff and Anoff : Introduction to Operations Research, Wiley chap. 7,7,17.
2. Hamdy A. Taha, Operations Research-An Introduction, Prentice Hall, 8<sup>th</sup> Edition, 2007
3. Gass. S.I.: Linear Programming. Methods and applications, Mc. Graw Hill
4. Satty, T. L: Mathematical Methods of Operations Research, Mc.Graw Hill

**Course Code: STAT/P-403****Title: Practical****Maximum Marks: 50/ 50**

Practical based on 401 and 402.

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. V Semester****Course Code: STAT/C-501****Title: Testing of Significance****Maximum Marks: 75 / 100****(a) Semester Examination: 60/ 80****(b) Semester/Internal Assessment 15/ 20**

**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, 11<sup>th</sup> Ed., Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta: Fundamentals of Statistics, Vol I, 8<sup>th</sup> 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/C-502**

**Title: Computational Techniques**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

**Unit 1:**

Historical evolution of computers, Generation of Computers, Classification of Computers.

**Unit 2:**

Hardware: CPU, Input-Output Devices, Block Diagram, System Software, MS-DOS: Filenames, Creating, Editing, and Printing of files, other file management commands, disk-management commands.

**Unit 3:**

Windows: The user interface, the desk top, the task bar, control panel, the file features, properties, font management, system tools, character map, note-pad, folders and short-cuts.

**Unit 4:**

M.S. Office, Working with MS- Excel.

**Books Recommended:**

1. R.A. Thisted (1988): Elements of Statistical Computing, Chapman and Hall
2. Pradeep Sinha and Priti Sinha: Computer Fundamentals 6<sup>th</sup> Edition, Bpb Publications
3. S. Jain: MS-Office 2007 Training Guide, BPB Publication
4. Alan Clements: The Principles of Computer Hardware, 4<sup>th</sup> Edition, Oxford

**Course Code: STAT/P-503**

**Title: Practical**

**Maximum Marks: 50/ 50**

Practical based on 501 and 502.

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. VI Semester

**Course Code: STAT/C-601**

**Title: Theory of Attributes & Quality Control**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

### **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, Association of attributes, Measure of association. Calculation of Chi-square.

### **Unit 2:**

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 ( $\bar{X}$ , 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  $\sigma$  cases).

### **Books Recommended**

1. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, 11<sup>th</sup> Ed., Sultan Chand and Sons, 2007
2. A.M. Goon, M.K. Gupta and B. Dasgupta: Fundamentals of Statistics, Vol I, 8<sup>th</sup> Ed., World Press, Kolkatta, 2005.

3. M. Ray, H.S. Sharma and Sanjay Chaudhary: Mathematical Statistics, Ram Prasad & Sons
4. S.C. Gupta, V.K. Kapoor: Fundamental of Applied Statistics, Sultan Chand and Sons

**Course Code: STAT/C-602**

**Title: Population Statistics**

**Maximum Marks: 75 / 100**

**(a) Semester Examination: 60/ 80**

**(b) Semester/Internal Assessment 15/ 20**

**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-603**

**Title: Practical**

**Maximum Marks: 50/ 50**

Practical based on 601 and 602. 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.