

**St. TERESA'S COLLEGE, ERNAKULAM (AUTONOMOUS)**

**DEPARTMENT OF STATISTICS**

**SYLLABUS**

**Under Choice Based Credit and Semester System**

**(Effective from 2018 admission)**

**PREAMBLE**

The Complementary courses in Statistics for the Bachelor's Programmes in Mathematics, Physics, Sociology, Computer Applications, Psychology, BCA and B.Voc.(Software Development) are framed by the Board of Studies using time tested and internationally popular text books so that the courses are at par with the courses offered by any other reputed university around the world.

Only those concepts that can be introduced at the under graduate level are selected and instead of cramming the course with too many ideas, the stress is given in doing the selected concepts rigorously. The course is framed in such a way that a student doing these courses will have developed the required analytical skills and logical reasoning required to identify problems, construct proofs and find solutions.

## **GRADUATE ATTRIBUTES**

The Department of Statistics is committed to provide a culturally enriched educational experience that will transform the lives of its students. Our aspiration is for graduates who have developed the knowledge, skills and attributes to equip them for life in a complex and rapidly changing world.

On completion of the Complementary courses in Statistics, students should be able to demonstrate the graduate attributes listed below

- *Professionalism, employability and enterprise*
  - Proficiency in problem solving, creativity, numeracy and self-management.
  - Confidence in accepting professional challenges, act with integrity, set themselves high standards.
  - Ability to work independently and along a team with professional integrity.
- *Learning and research skills*
  - Acquire skills of logical and analytical reasoning.
  - Develop a critical attitude towards knowledge.
  - Equipped to seek knowledge and to continue learning throughout their lives.
  - Develop intellectual curiosity, effective learning and research abilities.
- *Intellectual depth, breadth and adaptability*
  - Proficiency in curricular, co-curricular and extracurricular activities that deepen and broaden knowledge
  - Develop skills of analysis, application, synthesis, evaluation and criticality.
- *Respect for others*
  - Develop self-awareness, empathy, cultural awareness and mutual respect.
  - Ability to work in a wide range of cultural settings and inculcate respect for themselves and others and will be courteous.
- *Social responsibility*
  - Knowledge in ethical behaviour, sustainability and personal contribution.
  - Awareness in the environmental, social and cultural value system.

## **OBJECTIVES**

The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of Statistics by providing a more complete and logical frame work in almost all areas of basic Statistics.

By the end of the second semester, the students should have

- 1) Attained a secure foundation in Statistics to complement the core for their future courses.

By the end of the fourth semester, the students should have been

- 1) Introduced to powerful tools for tackling a wide range of topics in Standard distributions, Sampling distributions, Estimation and Testing of hypotheses.
- 2) Familiarized with additional relevant Statistical techniques and other relevant subjects to complement the core.

### **Course Code Format**

Every course is coded according to the following criteria.

1. The first letter plus second letter/any letter from the subject. Eg.- **ST (Statistics)**
2. One digit to indicate the semester. Eg. - **ST1 (Statistics, Semester1)**
3. One letter for the type of courses such as, **A** for common course, **B** for core course, **C** for Complementary course, **D** for Open course, Eg. – **ST1C (Statistics Semester 1, Complementary course)** and **P** for project.
4. Two digits to indicate the course number of that semester. Eg. - **ST1C01 (Statistics Semester 1, Complementary course, Course number 01)**.
5. The letter **B** to indicate Bachelors Programme. Eg. - **ST1C01B (Statistics Semester 1, Complementary course, Course number 01 and B for Bachelors Programme)**.
6. **18 to indicate the year in which the revised syllabus came into effect.**  
Eg. - **ST1C01B18**

If the department offers more than one complementary courses, Courses are coded as follows-

First course - (ST1C01B18/ST2C01B18/ST3C01B18/ST4C01B18)

Second course - (ST1C02B18/ST2C02B18/ST3C02B18/ST4C02B18)

### Scheme of Complementary/ Core Courses in Statistics

The following table shows the structure of the courses which indicates title of the courses, instructional hours and credits.

#### 1. Statistics Courses for B.Sc. Mathematics, Physics, Computer Applications and BCA

Semester	Title of the paper	Course Code	Number of hours per week	Total Credits	Total hours/ semester	End Semester Assessment duration (hrs)
I	<b>Descriptive Statistics</b> (Complementary for Mathematics, Physics and BCA and Core for Computer Applications )	<b>ST1C01B18/ ST1B01B18</b>	4	3	72	3
II	<b>Probability and Random Variables</b> (Complementary for Mathematics and Physics and Core for Computer Applications)	<b>ST2C01B18/ ST2B02B18</b>	4	3	72	3
III	<b>Probability Distributions</b> (Complementary for Mathematics and Physics and Core for Computer Applications)	<b>ST3C01B18/ ST3B03B18</b>	5	4	90	3
IV	<b>Statistical Inference</b> (Complementary for Mathematics and Physics and Core for Computer Applications)	<b>ST4C01B18/ ST4B04B18</b>	5	4	90	3

## 2. Statistics Courses for B.A. Sociology

Semester	Title of the paper	Course Code	Number of hours per week	Total Credits	Total hours/ semester	End Semester Assessment duration (hrs)
III	<b>Basic Statistics</b>	<b>ST3C03B18</b>	6	4	108	3
IV	<b>Statistical Tools</b>	<b>ST4C03B18</b>	6	4	108	3

## 3. Statistics Courses for B.Sc. Computer Applications

Semester	Title of the paper	Course Code	Number of hours per week	Total Credits	Total hours/ semester	End Semester Assessment duration (hrs)
IV	<b>Sample Surveys and Design of Experiments</b>	<b>ST4B05B18</b>	5	4	90	3
V	<b>Environmental Studies, Human rights and Numerical methods</b>	<b>ST5B06B18</b>	5	4	90	3
VI	<b>Optimization Techniques</b>	<b>ST6B07B18</b>	5	4	90	3

## 4. Statistics Courses for B.Sc. Psychology

Semester	Title of the paper	Course Code	Number of hours per week	Total Credits	Total hours/ semester	End Semester Assessment duration (hrs)
I	<b>Basic Statistics</b>	<b>ST1C02B18</b>	3	2	54	3
II	<b>Statistical Tools</b>	<b>ST2C02B18</b>	3	2	54	3
III	<b>Probability and Probability Distributions</b>	<b>ST3C02B18</b>	3	2	54	3
IV	<b>Testing of Hypotheses</b>	<b>ST4C02B18</b>	3	2	54	3

## 5. Statistics Course for B.Voc.(Software Development)

Semester	Title of the paper	Course Code	Number of hours per week	Total Credits	Total hours/ semester	End Semester Assessment duration (hrs)
III	<b>Basic Statistics and SPSS</b>	<b>ST3C04B18</b>	4	4	72	3

## Examinations

The evaluation of each course shall contain two parts such as or In-Semester Assessment (ISA) and End-Semester Assessment (ESA) . The ratio between ISA and ESA shall be 1:4(20%: 80%)

### Assessment Pattern:

Item	Percentage
In-Semester Assessment	20
End-Semester Assessment	80

### In-Semester Assessment (ISA):

In-Semester Assessment is to be done by continuous assessments on the following components. The Components of the In-Semester Assessment for theory papers are as below.

#### Theory:

Component	Marks
Attendance	5
Assignment/Seminar	5
Test papers (2 x 5)	10

#### Attendance:

% of Attendance	Marks
>90%	5
Between 85 and 90	4
Between 80 and 85	3
Between 75 and 80	2
75 %	1
< 75	0

**Assignments:**

There will be one assignment per course in each of the first four Semesters.

**In-Semester Assessment:**

The evaluation of all components is to be published and is to be acknowledged by the candidate. The responsibility of evaluating the internal assessment is vested on the teacher(s) who teach the course.

**End-Semester Assessment:**

The End-Semester examination of all courses shall be conducted by the College on the close of each semester. For reappearance/ improvement, students can appear along with the next batch.

**Pattern of Question Paper:**

A question paper shall be a judicious mix of short answer type, short essay type/ problem solving type and long essay type questions.

For each course the Final Assessment is of 3 hours duration. The question paper has 3 parts. Part A contains 12 short answer questions of which 10 are to be answered each of 2 marks. Part B contains 9 short essay questions of which 6 are to be answered and each has 5 marks. Part C has 4 long essay questions of which 2 are to be answered and each has 15 marks.

<b>Part</b>	<b>No. of Questions</b>	<b>No. of questions to be answered</b>	<b>Marks</b>
A (Short Answer)	12	10	10 x 2 = 20
B (Short Essay)	9	6	6 x 5 = 30
C (Long Essay)	4	2	2 x 15 = 30



Grades and Grade points for each course will awarded on a 7-point scale based on the total percentage of marks (ISA + ESA) for all courses (theory, practical, project)

<b>% of marks (ISA + ESA)</b>	<b>Grade</b>	<b>Grade point</b>
<b>&gt;95</b>	<b>S - Outstanding</b>	<b>10</b>
<b>85 - 95</b>	<b>A<sup>+</sup> - Excellent</b>	<b>9</b>
<b>75 - 85</b>	<b>A - Very good</b>	<b>8</b>
<b>65 - 75</b>	<b>B<sup>+</sup> - Good</b>	<b>7</b>
<b>55 - 65</b>	<b>B - Above average</b>	<b>6</b>
<b>45 - 55</b>	<b>C - Satisfactory</b>	<b>5</b>
<b>35 - 45</b>	<b>D - Pass</b>	<b>4</b>
<b>&lt;35</b>	<b>F - Failure</b>	<b>0</b>
	<b>Ab - Absent</b>	<b>0</b>

Note: A separate minimum of 30% marks each for ISA and ESA and aggregate minimum of 35% are required for a pass for a course.

**Complementary Course for B.Sc. Mathematics & Physics and BCA  
And  
Core Course for B.Sc. Computer Applications  
I Semester – Statistics - Course I  
ST1C01B18 / ST1B01B18 - Descriptive Statistics**

**Objectives:** 1) To introduce the basic concepts in Statistics  
2) To develop data reduction techniques

**Course Overview and Context :**

This course introduces the basic concepts of Statistics. It outlines the techniques to expose the students to many Statistical ideas and rules that underlie Statistical reasoning

**Syllabus Content**

**Credits-3**

**Hours per week – 4, Total – 72 hours**

**Module I** (20 hours)

Introduction to Statistics, Population and Sample, Collection of Data, Various methods of data collection, Census and Sampling. Methods of Sampling – Simple Random Sampling– stratified sampling – systematic sampling (Method only), Types of data – quantitative, qualitative, Classification and Tabulation, Frequency Table, Diagrammatic representation – Bar diagram, pie diagram; pictogram and cartogram.

**Module II** (20 hours)

Measures of Central Tendency – Mean; Median; Mode; Geometric Mean; Harmonic Mean and Properties, Partition values- Quartiles, Deciles, Percentiles, Absolute and Relative measures of Dispersion – Range, Quartile Deviation, Box Plot, Mean Deviation, Standard Deviation, Coefficient of Variation.

Graphical representation – histogram, frequency polygon, frequency curve, ogives and stem and leaf chart.

**Module III** (16 hours)

Raw Moments, Central Moments, Inter Relationships (First Four Moments), Skewness – Measures – Pearson's, Bowley's and Moment Measure; Kurtosis- Measures of Kurtosis – Moment Measure, Measure based on partition values.

**Module IV** (16 hours)

Index Numbers – definition, limitations, uses, Simple Index Numbers; Weighted Index Numbers – Laspeyer's, Paasche's and Fisher's Index Numbers, Test of Index Numbers, Construction of Index Numbers, Cost of Living Index Numbers – Family Budget Method, Aggregate Expenditure Method.

**Reference**

- S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi).
- S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- B.L. Agarwal: Basic Statistics, New Age International (P) Ltd.
- Parimal Mukhopadhyaya: Mathematical Statistics, New Central Book Agency (P) Ltd, Calcutta
- Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta

**Competencies of the course:**

- Develop the fundamentals of Statistics, Present numerical facts through tables and graphs
- Summarise a mass of raw data into a meaningful form
- Describe the fundamental characteristics of data
- Know the general pulse of economy

**Blue Print- ST1C01B18 / ST1B01B18 - Descriptive Statistics**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	2	2
II	4	3	
III	2	3	1
IV	3	1	1

**MODEL QUESTION PAPER  
B.Sc. DEGREE EXAMINATION  
First Semester**

Complementary Course (Statistics) for MATHEMATICS, PHYSICS AND BCA  
And  
Core Course (Statistics) for COMPUTER APPLICATIONS  
**ST1C01B18 / ST1B01B18– DESCRIPTIVE STATISTICS**

Time: 3 hours

Max.: 80 marks

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer *any ten* questions.

Each question carries 2 marks.

1. Define Simple random sampling
2. Give the sources of secondary data.
3. Distinguish between Census and sample survey.
4. Define Mean deviation.
5. Prove that the sum of deviations of observations from its A.M is zero.
6. Find the standard deviation of the numbers 7,9,16,24,26
7. What is the difference between a Bar diagram and a Histogram.
8. The first two moments of a distribution about  $X = 4$  are 1 and 4. Find the mean and variance.

9. Explain 'Skewness' and 'Kurtosis'.
10. What is commodity reversal test?
11. If  $\sum P_k = 360$ ,  $\sum P_o = 300$  find the simple aggregate Index number.
12. Examine whether Laspeyer's Index number satisfies Factor reversal test.

(10x2 = 20 marks)

**Part B (Short Essay Questions)**

Answer any *six* questions.

Each question carries 5 marks.

13. Draw an ogive for the following data and hence find Median.

C. I: 25-40 40-55 55-70 70-85 85-100

F: 7 13 21 12 9

14. What are the parts of a table?

15. Explain Box Plot.

16. Find Mean, Median and using the Empirical relation find Mode.

X: 4 8 12 16 20 24

F: 2 7 15 11 9 6

17. Establish the effect of change of origin and scale on standard deviation.

18. Establish the relation between Raw and Central moments.

19. For a distribution the Mean is 10, Variance is 16,  $\beta_1 = 1$ ,  $\beta_2 = 4$ , Obtain the first four moments about 0.

20. The first four moments about 2 of a distribution are 1, 2.5, 5.5, and 16. Comment on its skewness and kurtosis.

21. Explain the various steps involved in the Construction of an Index Number.

(6x5 = 30 marks)

**Part C (Essay Questions)**

Answer any *two* questions.

Each question carries 15 marks.

22. (a) What is an Ogive? Explain how the Ogive can be used to find out the Median and Quartiles?

(b) Explain Stem and Leaf Chart.

23. An Analysis of monthly wages paid to workers in two firms A and B belonging to the same Industry, gives the following results.

	Firm A	Firm B
No. Of wage earners	550	650
Average monthly wages	50	45
Variance of the distribution of wages	90	120

- Which firm A or B pays out larger amount as monthly wages?
- In which firm A or B is there greater variability in Individual wages?
- What are the measures of average and Standard deviation of monthly wages of all the workers in the two firms taken together ?

24. Calculate Laspeyer's, Paasche's and hence Fisher's Index numbers for the following data.

Commodity	Price(Rs per unit)		Quantity (Kg)	
	Base year	Current year	Base year	Current year
A	20	30	12	18
B	30	42	10	14
C	22	34	6	10
D	18	28	8	12

25. (a) Show that  $\beta_2 > 1$  for a Discrete distribution.

(b) Calculate Pearson's Coefficient of Skewness for the following distribution

Variable	0-5	5-10	10-15	15 – 20	20 – 25	25 -30	30-35
Frequency	3	5	9	15	21	10	7

(2x15 = 30 marks)

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**Complementary Course for B.Sc. Mathematics & Physics  
And  
Core Course for B.Sc. Computer Applications  
II Semester – Statistics - Course II  
ST2C01B18 / ST2B02B18 – Probability and Random Variables**

**Objectives:** 1) To introduce Probability theory as a foundation for Statistics.  
2) To help students understand the basic notions about random variables.

**Course Overview and Context :**

This course explains step by step development of fundamental principles of Statistics, Probability concepts and Random variables.

**Syllabus Content**

**Credits-3**

**Hours per week – 4, Total – 72 hours**

**Module I** (16 hours)

Introduction to bivariate data. Correlation-Different types of Correlation. Concepts of Simple, Multiple and Partial Correlations. Simple Linear Correlation – Methods of finding simple linear Correlation – Scatter Diagram, Covariance Method, Rank Correlation (equal ranks).

**Module II** (16 hours)

Curve Fitting – Method of Least squares- Fitting of Straight Lines, Second Degree Equation, Exponential Curve, Power Curve. Simple Linear Regression – Regression Equations – Fitting and identification, properties.

**Module III** (20 hours)

Probability Concepts – Random Experiment, Sample Space, Events, Probability Measure, Approaches to Probability – Classical, Statistical and Axiomatic, Addition Theorem (upto 3 events) Conditional Probability, Independence of events, Multiplication theorem (upto 3 events), Total Probability Law, Baye's Theorem and its applications.

**Module IV** (20 hours)

Random Variables – Discrete and Continuous, Probability Distributions – Probability Mass Function; Probability Density Function and Cumulative (distribution) function and their properties, change of variables (Univariate only), Bivariate random variables – Definition – Discrete and Continuous, Joint Probability Density Functions, Marginal and Conditional Distributions, Independence of Random Variables.

**Reference**

- John E. Freund: Mathematical Statistics, Prentice Hall of India
- S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
- S.P. Gupta: Statistical Methods, , Sultan Chand and Sons, New Delhi
- V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.
- B.R. Bhat, Modern Probability Theory, New Age International (p) Ltd.

**Competencies of the course:**

- Determine Degree of relationship between variables
- Nature of relationship and application of method of curve fitting
- Decisions in the face of uncertainty
- Explain the concepts of Probability distributions

**Blue Print - ST2C01B18 / ST2B02B18 - Probability and Random Variables**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	2	1
II	3	2	1
III	3	2	1
IV	3	3	1

**MODEL QUESTION PAPER**  
**B.Sc. DEGREE EXAMINATION**  
**Second Semester**

Complementary Course (Statistics) for MATHEMATICS and PHYSICS  
And

Core Course (Statistics) for COMPUTER APPLICATIONS

**ST2C01B18 / ST2B02B18 - PROBABILITY AND RANDOM VARIABLES**

Time: 3 hours

Max.: 80 marks

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer *any ten* questions.

Each question carries 2 marks.

1. What are the different types of Correlation?
2. Given the following data, find the correlation co-efficient  
 $n = 12, \sum x = 30, \sum y = 5, \sum x^2 = 670, \sum y^2 = 285$  and  $\sum xy = 334$
3. Show that  $2r\sigma_x\sigma_y = \sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2$
4. Describe the principle of least squares used for estimation of parameters.
5. Find the angle between the regression lines if  $\sigma_x = \sigma_y = 0.5$  and  $r = \sqrt{2} - 1$ .

6. How can the two regression lines be identified?
7. Give the classical definition of probability.
8. Define conditional probability.
9. What is the probability of getting 53 Sundays in a leap year?
10. What are the properties of a p.d.f of a discrete random variable?
11. Distinguish between Discrete and Continuous random variables.
12. Find k if  $f(x) = kx(1-x)$  ;  $0 \leq x \leq 1$  and 0 elsewhere is a p.d.f of a continuous random variable.

(10x2 = 20 marks)

**Part B (Short Essay Questions)**

Answer any *six* questions.

Each question carries 5 marks.

13. Fit a straight line of the form  $y = a + bx$  to the following data

X	0	1	2	3	4
Y	0	1.8	3.3	4.5	6.3
14. By the method of least squares find the regression line of Y on X
15. Derive the formula of Rank Correlation coefficient.
16. Show that the correlation coefficient is independent of origin and scale.
17. State and prove addition theorem of probability.
18. (a) Distinguish between Pair wise and Mutual independence of probability.  
(b) Show that A and B are independent if and only if  $P(B/A) = P(A/B^c)$
19. Define joint probability distribution function of a continuous random variable and state its properties.
20. If the distribution function of a random variable X is  $F(x) = 0$  if  $x \leq 0$ ;  $x$  if  $0 \leq x \leq 1$ ; 1 if  $x > 1$ . Find the p.d.f of  $Y = 2X + 3$
21. A continuous random variable X has pdf  $f(x) = ax$  ;  $0 \leq x \leq 1$   
 $a$  ;  $1 \leq x \leq 2$   
 $a(3 - x)$ ;  $2 \leq x \leq 3$   
Find (i) a (ii)  $P[X \leq 1.5]$

(6x5 = 30 marks)



**Part C (Essay Questions)**

Answer any *two* questions.

Each question carries 15 marks.

22. (a) State and prove Baye's theorem.

(b) The chances of A, B, C becoming Managers of a company are in the ratio 4 : 2 : 3. The probabilities that a reform will be introduced if A, B , C become Managers are 0.3, 0.5, 0.8 respectively. The reform has been introduced. What is the probability that B is appointed as the Manager?

23. The joint p.d.f of (X,Y) is given in the following table. Find

- (a) The marginal distributions.
- (b)  $f(x/ y = 3 )$  and  $f(y/ x = 2)$
- (c)  $P(X \geq 2)$
- (d) Examine whether X and Y are independent.

X \ Y	1	2	3
1	0.10	0.20	0.10
2	0.15	0.10	0.18
3	0.02	0.05	0.10

24. From the following data obtain the Pearson's coefficient of correlation

X	10	15	12	17	13	16	24	14	22
Y	30	42	45	46	33	34	40	35	39

25. Given the following data

Variance of x = 9, Regression equations are  $8x - 10y + 66 = 0$  and  $40x - 18y = 214$ .

- Find
- (a) mean values of x and y.
  - (b) the correlation coefficient between x and y
  - (c) the standard deviation of y

(2x15 = 30 marks)

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**Complementary Course for B.Sc. Mathematics & Physics  
And  
Core Course for B.Sc. Computer Applications  
III Semester – Statistics - Course III  
ST3C01B18 / ST3B03B18 - Probability Distributions**

**Objective:** 1) To impart essential knowledge in Probability distributions  
2) To expose the real-life applications of Probability distributions

**Course Overview and Context :**

This course explains the different types of Probability distributions with their real life applications.

**Syllabus Content**

**Credits-4**

**Hours per week – 5, Total – 90 hours**

**Module I** (25 hours)

Mathematical Expectation – Expectation of a Random Variable, Moments in terms of Expectations, Moment Generating Functions (m.g.f.) and its properties. Characteristic Functions and its Simple Properties, Conditional Expectation.

**Module II** (25 hours)

Discrete Probability Distributions – Uniform; Geometric; Bernoulli; Binomial; Hyper geometric; Poisson; Fitting of Distributions (Binomial and Poisson). Properties – Mean, Variance, m.g.f., Additive property; recurrence relation for moments (binomial and Poisson) Memorylessness property of Geometric distribution.

**Module III** (25 hours)

Continuous distributions – Uniform; Exponential; Gamma; Beta (type I and II); Normal; Standard Normal – definitions, Mean, Variance, m.g.f., Additive property, Memorylessness property of exponential distribution Fitting of Normal, Use of Standard Normal Tables for Computation of Various Probabilities.

**Module IV** (15 hours)

Tchebycheff's Inequality, Weak Law of Large Numbers, Bernoulli's Law of Large Numbers, Central Limit Theorem (Lindberg-Levy form) with proof.

**Reference**

- S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
- Hogg, R.V. and Craig A.T. (1970). Introduction to Mathematical Statistics, Amerind Publishing Co, Pvt. Ltd.
- V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill
- Johnson, N.L, Kotz, S. and Balakrishnan N. (1994). Continuous Univariate Distribution, John Wiley, New York.
- Johnson, N.L, Kotz, S. and Kemp, A.W. : Univariate Discrete Distributions, John Wiley, New York.

**Competencies of the course:**

- Describe the four characteristics of a random variable
- Explain the various properties of some discrete random variables
- Bring out the applications of continuous distributions
- Describe the uses of Central limit theorem

**Blue Print - ST3C01B18 / ST3B03B18 - Probability Distributions**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	4	3	1
II	3	2	1
III	3	2	1
IV	2	2	1

**MODEL QUESTION PAPER**  
**B.Sc. DEGREE EXAMINATION**  
**Third Semester**

Complementary Course (Statistics) for MATHEMATICS and PHYSICS  
And  
Core Course (Statistics) for COMPUTER APPLICATIONS  
**ST3C01B18 / ST3B03B18 - PROBABILITY DISTRIBUTIONS**

Time: 3 hours

Max.: 80 marks

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer *any ten* questions.

Each question carries 2 marks.

1. State the addition theorem on Expectation for two random variables X and Y.
2. Define Moment generating function of a random variable.
3. For any two independent random variables X and Y, show that  $E(XY) = E(X)E(Y)$ .
4. A balanced die is tossed. A person receives Rs. 10/- if an even number turns up. Otherwise he loses Rs. 8/-. How much money can he expect on the average in the long run?
5. If X is a Geometric random variable, calculate (i)  $P(X > 5)$  and (ii)  $P(X > 7|X > 2)$ .  
State your conclusion.

6. Show how a hyper geometric distribution arises by giving an example.
7. If for a binomial distribution,  $p = \frac{1}{2}$ , then what will be the skewness of the distribution?
8. If  $X$  follows Uniform distribution over  $[0,1]$ , then state the distribution of  $Y = -2 \log X$ .
9. Define Beta distribution of the first type.
10. If  $X \sim N(30, 5)$ , find  $P[26 < X < 40]$ .
11. State the Tchebychev's inequality.
12. Two unbiased dice are tossed. If  $X$  is the sum of the numbers obtained, show that

$$P[|X - 7| \geq 3] \leq \frac{35}{54}.$$

(10x2 = 20 marks)

**Part B (Short Essay Questions)**

Answer any *six* questions.

Each question carries 5 marks.

13. For a random variable  $X$ ,  $2 \log M_X(t) = 30t + 90t^2$ . Find its mean, variance and third central moment.
14. State and prove Cauchy-Schwartz inequality.
15. If the joint pdf of a random variable  $(X, Y)$  is  $f(x, y) = x + y$ ;  $0 < x < 1$ ,  $0 < y < 1$ . Find covariance between  $X$  and  $Y$ .
16. Derive the recurrence relation for raw moments of  $B(n, p)$ .
17. Obtain Poisson distribution as a limiting form of Binomial distribution.
18. Show that Beta distribution of the first type can be obtained from Beta distribution of the second type by means of a transformation.
19. Show that QD: MD: SD = 10: 12: 15, for a Normal random variable with mean  $\mu$  and Standard deviation  $\sigma$ .
20. State and prove Bernoulli form of Weak Law of Large Numbers. What are its assumptions?
21. How many trials should be performed so that the probability of obtaining atleast 40 successes is atleast 0.95, if the trials are independent and probability of success in a single trial is 0.2?

(6x5 = 30 marks)

**Part C (Essay Questions)**

Answer any *two* questions.

Each question carries 15 marks.

22. (a) Define conditional expectation and conditional variance.

(b) If  $f(x,y) = x+y$ ;  $0 < x < 1$ ,  $0 < y < 1$  is the joint p.d.f. of  $(X,Y)$ , find correlation between  $X$  and  $Y$ .

23. (a) The following table gives the number of heads obtained in 30 repetitions when 4 biased coins were tossed. Fit an appropriate Binomial distribution and calculate the expected frequencies

No. of heads	0	1	2	3	4
Frequency	2	7	13	6	2

(b) What are the expected frequencies if the coins are assumed to be unbiased?

24. Derive the recurrence relation for central moments of a Normal distribution with parameters  $\mu$  and  $\sigma$  and hence obtain  $\beta_1$  and  $\beta_2$ .

25. A random sample of size 100 is taken from an infinite population with mean 75 and variance 256

(a) Using Tchebychev's inequality, find  $P[67 < X < 83]$

(b) Using Central limit theorem, find  $P[67 < X < 83]$

(2x15 = 30 marks)

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**Complementary Course for B.Sc. Mathematics & Physics  
And  
Core Course for B.Sc. Computer Applications  
IV Semester – Statistics - Course IV  
ST4C01B18 / ST4B04B18 - Statistical Inference**

**Objective:** 1) To equip the students with the theory essential for estimation of unknown parameters and testing of hypotheses  
2) To expose the students to its real-life applications.

**Course Overview and Context :**

This course introduces the methods of drawing conclusions about a population by analyzing and studying samples drawn from the population.

**Syllabus Content**

**Credits-4**

**Hours per week – 5, Total – 90 hours**

**Module I** (20 hours)

Sampling Distributions – definition, Statistic, Parameter, Standard Error, Sampling Distributions of Mean and Variance,  $\chi^2$ , t and F (without derivation), properties, Inter relationships.

**Module II** (30 hours)

Concepts of Estimation, Types of Estimation – Point Estimation; Interval Estimation, Properties of Estimation – Unbiasedness, Efficiency; Consistency; Sufficiency. Methods of Estimation – MLE, Methods of Moments, Method of Minimum Variance, Cramer Rao Inequality (without proof), Interval Estimation for Mean, Variance and Proportion.

**Module III** (20 hours)

Testing of hypothesis- Statistical hypothesis, Simple and composite hypothesis Null and Alternate hypothesis, Type I and Type II errors, Critical Region, Size of the test, P value, Power, Neyman Pearson approach

**Module IV** (20 hours)

Large Sample tests – Z test, Chi-Square test-goodness of fit, test of independence. Small sample tests – Normal tests, t - test, Chi-square test, F- test.

**Reference**

- S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
- Richard Johnson (2006): Probability and Statistics for Engineers (Miller and Freund). Prentice Hall.
- S.C Gupta : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Mood A.M., Graybill F.A. and Boes D.C. Introduction to Theory of Statistics, McGraw Hill.

**Competencies of the course:**

- Introduce the concepts of Statistic and Sampling distribution
- Explain the method of estimating parameters of a population
- Describe the procedure of testing of hypotheses
- Explain standard error and testing procedures for parameters of a Normal population using large and small samples

**Blue Print - ST4C01B18 / ST4B04B18 - Statistical Inference**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	2	2	1
II	4	3	1
III	4	2	1
IV	2	2	1

**MODEL QUESTION PAPER**  
**B.Sc. DEGREE EXAMINATION**  
**Fourth Semester**

Complementary Course (Statistics) for MATHEMATICS and PHYSICS  
And

Core Course (Statistics) for COMPUTER APPLICATIONS

**ST4C01B18 / ST4B04B18 – STATISTICAL INFERENCE**

(Common for MATHEMATICS, PHYSICS and COMPUTER APPLICATIONS)

**Time: 3 hours**

**Max.: 80 marks**

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer *any ten* questions.

Each question carries 2 marks.

1. What do you mean by a sampling distribution?
2. Define t statistic. Give an example of a statistic that follows t-distribution.
3. Differentiate between Point estimation and Interval estimation.
4. If T is an unbiased estimate of  $\theta$ , examine whether  $T^2$  is unbiased for  $\theta^2$ .
5. Explain the method of moments for estimating unknown parameters of a population.
6. Give the interval estimate of mean of a normal distribution when standard deviation is known.
7. Explain the terms Type I error and Type II error.

8. Define Power of a test.
9. To test the hypothesis that 25% of articles produced by a machine are defective against the alternative that 50% are defective, the test suggested was to take a sample size 5 and reject the hypothesis if number of defectives is greater than 1. Find the significance level and power of the test.
10. Distinguish between simple and composite hypotheses with an example each.
11. Give the expression for the test statistic for testing the equality of the means of two normal populations when small samples are drawn from the populations with the same but unknown standard deviation.
12. Find the value of the  $\chi^2$  statistic from the following contingency table

	A <sub>1</sub>	A <sub>2</sub>
B <sub>1</sub>	14	16
B <sub>2</sub>	6	4

(10x2 = 20 marks)

### Part B (Short Essay Questions)

Answer any *six* questions.

Each question carries 5 marks.

13. A sample of size 16 is drawn from a Normal population has variance 5.76. Find c such that  $P[|\bar{x} - \mu| < c] = 0.95$ , where  $\bar{x}$  is the sample mean and  $\mu$  is the population mean.
14. If  $x_1, x_2, x_3, \dots, x_{16}$  is a random sample from a Normal population with mean 6 and standard deviation 2, find the distribution of
  - (a)  $\bar{x}$
  - (b)  $\sum_{i=1}^{16} \left(\frac{x_i - 6}{2}\right)^2$
  - (c)  $\frac{\bar{x} - 6}{\sqrt{\sum_{i=1}^{16} (x_i - 6)^2}}$
15. Examine whether sample variance is an unbiased estimate of the population variance for a normal population. If not suggest an unbiased estimate for the population variance
16. State the Cramer –Rao inequality. Examine whether the parameter  $\lambda$  of a Poisson distribution admits a minimum variance unbiased estimator. Also find the lower bound for the variance of any unbiased estimator of  $\lambda$ .
17. A sample poll of 100 voters in a given district indicated that 55 of them were in favour of a particular candidate. Find a 95% confidence interval for the proportion of voters in favour of that candidate.



18. The hypothesis  $H_0: \theta = 2$  is accepted against  $H_1: \theta = 5$  if  $X \leq 3$ , where  $X$  is the observation on a sample of size 1 from an exponential population with mean  $\theta$ . Find  $\alpha$  and  $\beta$ .
19. Obtain the most powerful test for testing  $H_0: \theta = \frac{1}{4}$  against  $H_1: \theta = \frac{1}{2}$  based on a sample of size 2 say  $x_1$  and  $x_2$ , if the p.d.f. in the population is  $f(x) = \theta(1 - \theta)^x$  ;  
 $x = 1, 2, 3, \dots$
20. Explain the procedure for testing the equality of variances of two Normal populations when samples of sizes less than 30 are drawn from the populations.
21. Four coins are tossed 80 times. The distribution of the number of heads obtained are as follows
- |               |   |    |    |    |   |       |
|---------------|---|----|----|----|---|-------|
| No. of heads: | 0 | 1  | 2  | 3  | 4 | Total |
| Frequency:    | 4 | 20 | 32 | 18 | 6 | 80    |
- Apply  $\chi^2$  test and test at 1% level whether the coins are unbiased.

(6x5 = 30 marks)

### Part C (Essay Questions)

Answer any *two* questions.

Each question carries 15 marks.

22. (a) Let  $s_1$  and  $s_2$  be the sample standard deviations of two random samples of sizes  $n_1$  and  $n_2$  from two normal populations having the same unknown variance  $\sigma^2$ . Derive the probability distribution of  $\frac{n_1 s_1^2 / n_1 - 1}{n_2 s_2^2 / n_2 - 1}$

(b) The following data on the measurements of the fat content of two kinds of Ice-creams brand A and brand B yielded the following results

Brand A      13.5   14.0   13.6   12.9   13.0

Brand B      12.9   13.0   12.4   13.5   12.7

Find  $P[\sigma_1^2 > 5.75 \sigma_2^2]$  where  $\sigma_1^2$  and  $\sigma_2^2$  are the population variances

23. (a)  $X$  is uniformly distributed in (a,b). A sample of size 5 consists of the observations 3.1, 0.2, 1.6, 5.2 and 2.1. Find the moment estimates of a and b.

- (b) A sample of 100 voters were asked to vote in a gallop poll. 55% of them voted in favour of the candidate. Find 95% and 99% confidence interval for proportion of voters who are in favour of the candidate.
24. Obtain the best critical region of size  $\alpha$  for testing  $H_0: \mu = 6$  against  $H_1: \mu = 6.5$ , where  $\mu$  is the mean of a Normal population with variance 1, using a sample of size  $n$ . Also find the power of this test when  $n = 4, 9, 16$  and  $25$
25. Given the following contingency table test whether there is any association between hair colour and eye colour.

Eye colour	Hair colour		
	Blonde	Brown	Black
Blue	15	5	20
Grey	20	10	20
Brown	25	15	20

(2x15 = 30 marks)

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## Complementary Course to Sociology

### III Semester – Complementary – Statistics - Course I

#### ST3C03B18 - Basic Statistics

- Objectives:**
- 1) To introduce the basic concepts in Statistics
  - 2) To develop data reduction techniques

#### Course Overview and Context :

This course introduces the basic concepts of Statistics. It outlines the techniques to expose the students to many Statistical ideas and rules that underlie Statistical reasoning

#### Syllabus Content

**Credits-4**

**Hours per week –6, Total – 108 hours**

#### Module I (24 hours)

Meaning and Scope of Statistics – Importance, Limitations and Functions of Statistics. Collection of Statistical data from primary and secondary sources, Methods of collecting primary data , sources of secondary data and reliability of secondary data. Different scales of measurements.

#### Module II (18 hours)

Census and Sampling – Advantages and disadvantages, Limitations. Methods of Sampling- Simple random sampling. Stratified sampling, systematic sampling.(Methods only)

#### Module III (30 hours)

Classification and Tabulation, frequency tables – Discrete and continuous, Univariate and bivariate, Cumulative frequency distributions. Diagrammatic and Graphic representation of data: Diagrams- Bar diagrams, Pie diagrams, Pictograms and Cartograms. Graphs- Histograms, Frequency polygon, Frequency curves, Ogives.

#### Module IV (36 hours)

Measures of central tendency – Arithmetic Mean , Median , Mode , Properties of a good measure, Merits and demerits, Measures of Dispersion – Range , Quartile deviation , Standard deviation, Co-efficient of Variation, Properties of a good measure, Merits and demerits

#### Reference

- S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi).
- S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- B.L. Agarwal: Basic Statistics, New Age International (P) Ltd.

**Competencies of the course:**

- Explain the functions and uses of Statistics
- Distinguish between Census survey and Sample survey
- Represent quantitative data in the form of frequency distributions, diagrams and graphs
- Describe the fundamental characteristics of data

**Blue Print - ST3C03B18 - Basic Statistics**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	2	1
II	2	2	1
III	3	2	1
IV	4	3	1

**MODEL QUESTION PAPER**  
**B.A. DEGREE EXAMINATION**  
**Third Semester**  
Complementary Course (Statistics)  
**ST3C03B18 – BASIC STATISTICS**  
(For B.A. Sociology)

Time: 3 hours

Max.: 80 marks

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer *any ten* questions.

Each question carries 2 marks.

1. What is a primary data?
2. What are the limitations of Statistics?
3. What are the points to be observed while preparing a questionnaire?
4. Define a random sample.
5. Explain systematic sampling.
6. What is meant by geographical classification?
7. What is meant by tabulation of data?

8. Distinguish between Bar diagrams and Histograms.
9. Define range.
10. Which is the most unstable measure of central tendency? Why?
11. Find the mean deviation from median of the following values:5,8,4,6,2,9,7.
12. Give the formula for finding the combined mean of 3 sets of observations.

(10x2 = 20 marks)

**Part B (Short Essay Questions)**

Answer any *six* questions.

Each question carries 5 marks.

13. What are the precautions to be taken before using secondary data?
14. Which are the different sources of collecting secondary data?
15. Explain lottery method of collecting simple random sampling.
16. What are the advantages of census over sampling?
17. Write a short note on pie diagram.
18. Find the arithmetic mean of the data.

x	0	1	2	3	4	5
f	8	5	12	10	12	3

19. What are the requirements of a good measure of dispersion?
20. The mean mark of 100 students was found to be 75. Later it was found that a mark 53 was misread as 83. Find the correct mean.
21. Find the standard deviation from the following data

Variable	2	4	6	8	10
Frequency	8	10	16	9	7

(6x5 = 30 marks)

**Part C (Essay Questions)**

Answer any *two* questions.

Each question carries 15 marks.

22. Explain the different sources of collecting primary data.
23. Explain the different methods of sampling.

24. Draw less than and greater than ogives for the following data and hence find the median.

class	0-20	20-40	40-60	60-80
frequency	7	16	13	4

25. Calculate the mean and median of the following data

Class	0-5	5-10	10-15	15-20	20-25
frequency	3	12	18	7	5

(2x15 = 30 marks)

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**Complementary Course to Sociology**  
**IV Semester – Complementary – Statistics - Course II**  
**ST4C03B18 – Statistical Tools**

**Objectives:** 1) To introduce Probability theory as a foundation for Statistics.  
2) To equip the students with the theory essential for testing of hypotheses

**Course Overview and Context :**

This course explains the concepts of degree and nature of relationship between variables, introduces probability and random variables and explains testing of hypotheses.

**Syllabus Content**

**Credits-4**

**Hours per week – 6, Total – 108 hours**

**Module I** (24 hours)

Correlation and Regression: Simple Correlation- Scatter diagram, Karl Pearson's co-efficient of correlation, Spearman's Rank correlation. Simple linear regression, Regression lines- Identification of regression lines.

**Module II** (30 hours)

Random Experiment- sample space, event, -Algebra of events- classical and Statistical definition of probability- simple problems-Addition theorem of two events-statement only- conditional probability- Independence of events-elementary applications

**Module III** (30 hours)

Random variables (Discrete and Continuous) - probability density function- Binomial and normal distributions – Properties and Simple applications.

**Module IV** (24 hours)

Testing of hypothesis - Null and alternate hypothesis, significance level, power of the test, Z tests for means and proportion (one sample and two samples).

**Reference:**

- S. P. Gupta: Statistical Methods, Sultan Chand and Sons, New Delhi.
- S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- Fundamentals of Statistics: DN Elhance, Kitab Mahal, Allahabad.

**Competencies of the course:**

- Determine Degree of relationship between variables
- Predict the value of the dependent variable when the corresponding value of the independent variable is known
- Introduce the concept of probability and random variables
- Explain standard error and testing procedures for parameters of a Normal population using large samples

**Blue Print - ST4C03B18 – Statistical Tools**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	4	3	2
II	3	2	1
III	2	2	
IV	3	2	1

**MODEL QUESTION PAPER**  
**B.A. DEGREE EXAMINATION**  
**Fourth Semester**  
Complementary Course (Statistics)  
**ST4C03B18 – STATISTICAL TOOLS**  
(For B.A. Sociology)

**Time: 3 hours**

**Max.: 80 marks**

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer *any ten* questions.

Each question carries 2 marks.

1. What are the limits within which the correlation coefficient should lie?
2. What is a scatter diagram?
3. Give the expression for spearman' rank correlation coefficient.
4. What is the relation between correlation coefficient and regression coefficients?



5. Define a random experiment.
6. Define the following: (i) sample space (ii) mutually exclusive events.
7. State the addition theorem on probability for 2 events.
8. Define probability density function.
9. Define expectation of a random variable.
10. Define null and alternative hypotheses.
11. Define type I and type II errors with regard to testing of hypotheses.
12. What is meant by power of a test?

(10x2 = 20 marks)

**Part B (Short Essay Questions)**

Answer any *six* questions.

Each question carries 5 marks.

13. Explain the different types of correlation.
14. State the properties of the regression coefficients and regression lines of a bivariate data.
15. Given the following information, calculate the correlation co-efficient  
 $\sum x = 117, \sum y = 260, \sum x^2 = 1313, \sum y^2 = 6580, \sum xy = 2827, n = 13.$
16. Write down the sample space of selecting families with four children each.
17. Define conditional probability and state multiplication theorem for independent events.
18. A random variable X follows a probability distribution as given below:

x	0	1	2	3
f(x)	$\frac{k}{2}$	$\frac{k}{3}$	$\frac{k+1}{3}$	$\frac{2k-1}{6}$

Find the value of k. also find the mean and variance of the variable.

19. For a binomial distribution mean= 4 and variance = 12/9. Write down the distribution.
20. Explain the terms (i) Standard error, (ii) level of significance and (iii) rejection region in the context of testing of hypotheses.
21. A sample of size 400 was drawn from a population and the sample was found to have a mean of 99 and a standard deviation of 8. Test the hypothesis that the mean in the population is 100.

(6x5 = 30 marks)

**Part C (Essay Questions)**

Answer any *two* questions.

Each question carries 15 marks.

22. Find the values of  $\bar{x}$  and  $\bar{y}$  if the regression lines are  $x+2y-5 = 0$  and  $2x+3y-8 = 0$ . Also find the coefficient of correlation.
23. Compute the Karl Pearson's co-efficient of correlation from the following data
- |             |    |    |    |    |    |    |    |    |    |    |
|-------------|----|----|----|----|----|----|----|----|----|----|
| Price(Rs.)  | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Demand(Kgs) | 30 | 29 | 29 | 25 | 24 | 24 | 24 | 21 | 18 | 15 |
24. (a) Define normal distribution and state its important properties.  
(b) In a distribution 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution?
25. In a sample of 600 men from a certain city 400 are found to be smokers. Out of 900 from another city 450 are smokers. Do the data indicate that cities are significantly different as far as smoking habits of people are concerned? (significance level  $\alpha = 0.05$ )

(2x15 = 30 marks)

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**Core Course for Computer Applications**  
**IV Semester**  
**ST4B05B18 – Sample Survey and Design of Experiments**

**Objective of the course:** The objective of the course is to provide a sound practical background to sampling and particularly to design and analysis of sample survey. The course covers a broad range of situations in which sampling is used, with emphasis placed on sample surveys. The central aim is to provide the sound general background needed for carrying out a sample survey, including both practical aspects and the essential details on design and analysis.

**Course Overview and Context:** This course provides an introduction to sampling theory.

Three major topic areas are addressed:

- Simple random sampling
- Stratified random sampling
- Systematic sampling

This course also gives an introduction to the lay out and analysis of basic designs namely CRD,RBD,LSD.

**Syllabus Content**

**Credits-4**

**Hours per week – 5, Total – 90 hours**

**Module I** **(15 Hours)**

Basic concepts: Census and Sampling, Principal steps in a sample survey- Simple random sampling: Simple random sampling with and without replacement, unbiased estimates of the population mean and population total-their variances and estimates of the variances,

**Module II** **(30 Hours)**

Stratified random sampling: Estimation of the population mean and population total-their variances and estimates of the variances, proportional allocation and Neyman allocation of sample sizes, cost function – optimum allocation, comparison with simple random sampling, Systematic Sampling: Linear and Circular Systematic Sampling (basic concepts only)

**Module III** **(25 Hours)**

Principles of experimentation, linear estimation, estimability of parametric functions BLUE, Gauss Markov theorem(without proof), ANOVA of one way & two way classified data

**Module IV** **(20 Hours)**

Lay out and analysis of basic designs CRD, RBD, LSD missing plot techniques

## Learning Resources

### Textbooks

- D. Singh and F.S. Choudhary: Theory and Analysis of sample survey Designs, Wiley Eastern Ltd.
- S.C. Gupta and V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand & Co. New Delhi
- Cochran W.G.: Sampling Techniques, Wiley Eastern Ltd.  
Design and Analysis of Experiments 2/e (1986) M.N. Das and N.C. Giri, Wiley Eastern Limited,
- Linear Estimation and Design of Experiments (1987) D.D. Joshi, Wiley Eastern Limited.

### References

- Murthy M.N.: Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
- Sukhatme and Sukhatme: Sample survey methods and its applications, Indian Society of Agricultural Statistics.
- Design and Analysis of Experiments 5/e (2001) D.C. Montgomery, John Wiley and Sons, Inc.

### Competencies of the course:

- Define simple random sampling (with and without replacement)
- Explain procedure of selecting simple random sample
- Explain stratified sampling and systematic sampling
- Illustrate ANOVA of one way and two way classified data
- Explain the layout and analysis of basic designs

### Blue Print – ST4B05B18 – Sample Survey and Design of Experiments

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	3	1
II	3	2	1
III	4	2	1
IV	2	2	1

**Core Course for Computer Applications**  
**V Semester**  
**ST5B06B18 – Environmental Studies, Human Rights and Numerical**  
**Methods.**

**Objectives**

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues by developing and enhancing critical and creative thinking skills. It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. It encourages character building, and develop positive attitudes and values.
- To help the students in acquiring the basic knowledge about environment and the social norms that provide unity with environmental characteristics and create positive attitude about the environment.

**Course Overview and Context:** The syllabus of environmental studies includes five modules including human rights. The first two modules are purely environmental studies according to the UGC directions. The second two modules are strictly related with the core subject and fifth module is for human rights.

**Syllabus Content**

**Credits-4**

**Hours per week – 5, Total – 90 hours**

**Module I:**

**(20 Hours)**

**Unit 1 :Multidisciplinary nature of environmental studies**

Definition, scope and importance

Need for public awareness.

**Unit 2 : Natural Resources :**

Renewable and non-renewable resources : Natural resources and associated problems.

a) **Forest resources** : Use and over-exploitation, deforestation, case studies.Timber extraction, mining, dams and their effects on forest and tribal people.

b) **Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.

f) **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable life styles.

### **Unit 3: Ecosystems**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

## **Module II:**

**(25 Hours)**

### **Unit 1: Biodiversity and its conservation**

- Introduction
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India

### **Unit 2: Environmental Pollution**

Definition

Causes, effects and control measures of: -

- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution

- Thermal pollution
  - Nuclear hazards
- Pollution case studies

Disaster management: floods, earthquake, cyclone and landslides.

### **Unit 3: Social Issues and the Environment**

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air ( Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

### **Module III**

**(25 Hours)**

**Unit 1- Human Rights**– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

**Unit-2 Human Rights and United Nations** – contributions, main human rights related organs- UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

**Human Rights in India** – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

**Unit-3 Environment and Human Rights** - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

**Conservation of natural resources and human rights:** Reports, Case studies and policy

formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirangan report. Over exploitation of ground water resources, marine fisheries, sandmining etc.

#### Module IV

(20 Hours)

Solution to algebraic and transcendental equations:- Bisection Method, Iteration method, Regula -falsi method, Newton-Raphson method. Solution to Simultaneous linear equations:- Gauss elimination method, Gauss-Jordan methods, Jacobi's method, Gauss-Seidel method

#### Internal: Field study

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc

(Field work Equal to 5 lecture hours)

#### Books for study

- Bharucha, E. (2010). *Text Book for Environmental studies for undergraduate Courses*, University Grants Commission, New Delhi.
- Chatrath, K. J.S., (ed.), *Education for Human Rights and Democracy* (Shimla: Indian Institute of Advanced Studies, 1998)

#### References

- Agarwal, K. C. (2001). *Environmental Biology*, Nidi Publishers Ltd, Bikaner.
- Gupta, S.C. and Kapoor, V.K. (2014). *Fundamentals of Applied Statistics*, Sultan Chand & Co. New Delhi.
- Clark.R.S., *Marine Pollution*, Clarendon Press Oxford (Ref)
- Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 *Environmental Encyclopedia*, Jaico Publ. House. Mumbai. 1196p .(Ref)
- Dc A.K., *Environmental Chemistry*, Wiley Eastern Ltd.(Ref)
- Down to Earth, Centre for Science and Environment (Ref)

#### Competencies of the course:

- To know more about Environment
- To study about different types of resources
- To develop the sense of awareness among the students about the environment and



its various problems and to help the students in realizing the inter-relationship between man and environment and helps to protect the nature and natural resources.

- To have a basic idea about Human rights.
- To get familiar with different methods for obtaining solution to a system and a system of linear equations.

**Blue Print – ST5B06B18 – Environmental Studies, Human Rights and Numerical Methods.**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	2	0
II	2	2	1
III	3	2	1
IV	4	3	2

**Core Course for Computer Applications**  
**VI Semester**  
**ST6B07B18 – Optimization Techniques**

**Objective of the course:** The objective of this course is to introduce students to use quantitative methods and techniques for effective decision-making; model formulation and applications that are used in solving business decision problems

**Course Overview and Context:** Operations research helps in solving problems in different environments that needs decisions. The course cover topics that include: linear programming, Transportation, Assignment, and CPM/PERT techniques. Analytic techniques and computer packages can be used to solve problems facing business managers in decision environments

**Syllabus Content**

**Credits-4**

**Hours per week – 5, Total – 90 hours**

**Module I**

**(15 Hours)**

Operations Research: Origin and Development of OR, Objectives of OR, Modeling and types of models in OR.

**Module II**

**(30 Hours)**

Linear Programming: Mathematical formulation of LPP, Graphical and Simplex methods of solving LPP – Duality in Linear Programming.

**Module III**

**(30 Hours)**

Transportation and Assignment Problems: North – West Corner Rule, Row Column and Table Minima Method – Vogel's Approximation Method. Assignment Problem, Hungarian Algorithm of Solution.

**Module IV**

**(15 Hours)**

Network Analysis: Drawing the Network Diagram – Analysis of Network, Calculation of Critical Path – PERT, Expected Completion Time and its Variance.

**Learning Resources**

**Textbooks**

- KantiSwarup, Gupta P.K., Manmohan: Operations Research, Sultan Chand and Sons, New Delhi.

- Gupta R.K.: Operations Research, Krishna PrakashanMandir, Meerut.
- Schaum's Outline Series: Operation Research.

### References

- Hadley G.: Linear Programming, Addison – Wesley.
- Gupta and Manmohan: Linear Programming, Sultan Chand & Sons, New Delhi.
- Taha: Operations Research, Macmillian.
- Goel& Mittal: Operations Research, Pragati Prakashan, Meerut.
- V.K. Kapoor: Operations Research, Sultan Chand & Sons, New Delhi.

### Competencies of the course:

- Define Linear programming problems
- Explain simplex method
- Define transportation problem and assignment problem
- Explain Hungarian algorithm
- Explain CPM and PERT

### Blue Print – ST6B07B18 – Optimization Techniques

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	2	0
II	2	3	1
III	3	3	2
IV	4	1	1

## Complementary Course to B. Sc. Psychology

### Semester I–Course I

#### ST1C02B18 - BASIC STATISTICS

- Objectives :** 1) To introduce the basic concepts in Statistics  
2) To develop the knowledge of sampling techniques

**Course Overview and Context:**

This course introduces the basic concepts of Statistics. It outlines the techniques to expose the students to many Statistical ideas and rules that underline statistical reasoning.

#### Syllabus Content

**Credits-2**

**Hours per week – 3, Total – 54 hours**

**Module I ( 20 Hours)**

Introduction to Statistics-Introduction to Statistics. Need and importance of Statistics in Psychology. Variables and attributes, Levels of Measurement: Nominal, Ordinal, Interval and Ratio. Collection of data-primary and secondary, census and sampling, classification and tabulation, grouped and ungrouped frequency table .Diagrammatical and graphical representation of data- bar diagram, pie diagram, frequency polygon and curve, histogram, ogives

**Module II (14 Hours)**

Census and Sampling. Different methods of sampling. Requisites of a good sampling method. Advantages of sampling methods, Simple random sampling, Stratified sampling. Systematic sampling

**Module III (20 Hours)**

Measures of central tendency- mean, median and mode- properties, merits and demerits.

**Core Reference:**

- Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi.

**Additional References**

- Aron, A., Aron. R., & Coups, E. J. (2006).*Statistics for Psychology*. (4<sup>th</sup> ed). New Delhi: Pearson Education (ISBN: 81-317-1464-20).
- Mangal, S. K. (2002). *Statistics in Psychology and Education*. (2<sup>nd</sup> ed). New Delhi: Prentice-Hall of India Private Limited. (ISBN: 978-81-203-8).
- Hentry E Garrett – Statistics in Psychology & Education
- J.F. Guilford Fundamentals of Statistics in Psychology & Education-McGraw-Hill

- S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad.

**Note: The 5 marks for the Assignment component of Internal assessment may be given for solving problems from the above syllabus.**

**Competencies of the course:**

- Develop the fundamentals of Statistics, Present numerical facts through tables and graphs
- Summarise a mass of raw data into a meaningful form
- Describe the fundamental characteristics of data

**Blue Print – ST1C02B18 – Basic Statistics**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	4	3	2
II	4	2	1
III	4	4	1

**Model Question Paper**

**First Semester**

Complementary Course for B.Sc. Psychology

**ST1C02B18 – BASIC STATISTICS**

Time: 3 hours

Max.: 80 marks

*Use of Scientific calculators and Statistical tables are permitted.*

**Part A (Short Answer Questions)**

Answer any *ten* questions

Each question carries 2 marks.

1. State the uses of Ogives
2. Define Primary data
3. Define (i) Variable (ii) Attributes
4. Distinguish between grouped and ungrouped frequency table
5. State the merits and demerits of Arithmetic Mean
6. Define mode and find the mode of the given observations  
:24,67,90,54,24,12,34,54,64,70,24

7. Find the average speed of a plane travelling at speeds 46,59 and 30 km per hour respectively.
8. State the empirical relation between mean, median and mode
9. Differentiate between Census and sampling. Give examples
10. Define Population
11. Define Enumeration
12. Define Lottery Method

(10x2 = 20 marks)

**Part B (Short Essay Questions)**

Answer any *six* questions.

Each question carries 5 marks.

13. Define Variables and attributes with examples. Explain the classification of Variables.
14. Define grouped and ungrouped frequency tables with examples
15. Explain the construction of a cumulative frequency curve with an example.
16. State the merits and demerits of Sampling over census
17. Explain Simple Random Sampling
18. Explain the different measures of Central Tendency.
19. State the merits and demerits of Median and Mode
20. The AM of weight of 98 students as calculated from a frequency distribution is 50 kgs. It was later found that the frequency of the class (30-40) was wrongly taken as 8 instead of 10. Calculate the AM.
21. Calculate the Arithmetic Mean for a group of 10 observations if  $\sum(x_i - 5) = 20$

(6x5 = 30 marks)

**Part C (Essay Questions)**

Answer any *two* questions.

Each question carries 15 marks.

22. Explain the different types of sampling Methods in Detail.
23. (i) Define (a) Pictogram and (b) Cartogram (c) Pie Chart (d) Greater than Ogive (e) Tabulation  
(ii) Explain the scales based on the level of measurement of level of variables
24. (i) State the properties of Mean, Median and Mode.  
(ii) Eleven candidates appeared for a test. When result was declared, 4 of them got disqualified. The scores of the qualified candidates are 43,52,63,37,81,68,41. Find the median score of the candidates  
(iii) Find the missing Frequencies of the following data:

Size	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
frequency	15	20	10	-	13	10	-	6

25. Form a less than and a greater than Ogive , Frequency curve, Histogram, Bar Diagram and Frequency Polygon from the following frequency Table:

Class Interval	0-19	20-39	40-59	60-79	80-99	100-119
Frequency	9	10	5	6	4	3

(15x2 = 30 marks)

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## Complementary Course to B. Sc. Psychology

### Semester II - Course II

#### ST2C02B18- STATISTICAL TOOLS

**Objectives: 1) To develop data reduction Techniques**

**2) To identify the relationship between variables**

#### **Course Overview and Context:**

This course enables the students to develop data reduction techniques and also to identify the relationship between variables and by how much degree does the relationship exist

#### **Syllabus Content**

**Credits -2**

**Hours per week – 3, Total – 54 hours**

#### **Module I**

**(17 Hours)**

Measures of dispersion-Range, quartile deviation, mean deviation, standard deviation.

#### **Module II**

**(20 Hours)**

Raw Moments, Central Moments, Inter Relationships (First Four Moments),

Skewness – Measures – Pearson, Bowley and Moment Measure, Kurtosis-

Measures of Kurtosis – Moment Measure.

#### **Module III**

**(17 Hours)**

Karl Pearson's Coefficient of Correlation, Scatter Diagram, Interpretation of

Correlation Coefficient, Rank Correlation, Regression, Regression Equation,

Identifying the Regression Lines

#### **Core Reference:**

- Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi.

#### **Additional References**

- Aron, A., Aron. R., & Coups, E. J. (2006). *Statistics for Psychology*. (4<sup>th</sup> ed). New Delhi: Pearson Education (ISBN: 81-317-1464-20).
- Mangal, S. K. (2002). *Statistics in Psychology and Education*. (2<sup>nd</sup> ed). New Delhi: Prentice-Hall of India Private Limited. (ISBN: 978-81-203-8).



- Hentry E Garrett – Statistics in Psychology & Education
- J.F. Guilford Fundamentals of Statistics in Psychology & Education-McGraw-Hill
- S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
- Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad.

**Note: The 5 marks for the Assignment component of Internal assessment may be given for solving problems from the above syllabus.**

**Competencies of the course:**

- Describe the fundamental characteristics of data
- Determine Degree of relationship between variables
- Nature of relationship and application of method of curve fitting

**Blue Print – ST2C02B18 –Statistical Tools**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	4	1
II	5	1	2
III	4	4	1

## Complementary Course to B. Sc. Psychology

### Semester III - Course III

#### ST3C02B18- PROBABILITY AND PROBABILITY DISTRIBUTIONS

- Objectives:**
- 1) To introduce the basic concepts of Probability
  - 2) To introduce Binomial and Normal Distributions

**Course Overview and Context:**

This course introduces the basic concepts of Probability in Statistics and also makes the students understand the usage and importance of Binomial and Normal Distribution.

**Syllabus Content**

**Credits -2**

**Hours per week – 3, Total – 54 hours**

**Module-I (17 Hours)**

Probability: Basic concepts, different approaches, conditional probability, independence, addition theorem, multiplication theorem (without proof) for two events, simple examples.

**Module-II (17 Hours)**

Random variables, Discrete and Continuous, p.m.f and p.d.f., c.d.f of discrete random variable, Mathematical Expectation of a discrete random variable, Mean and Variance of a discrete random variable.

**Module-III (20 Hours)**

Binomial distribution- mean and variance, simple examples. Normal distribution - definition, p.d.f. simple properties, calculation of probabilities using standard normal tables, simple problems.

**Core Reference:**

- Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi

**Additional References**

- Aron, A., Aron. R., & Coups, E. J. (2006). *Statistics for Psychology*. (4<sup>th</sup> ed). New Delhi: Pearson Education (ISBN: 81-317-1464-20).
- Mangal, S. K. (2002). *Statistics in Psychology and Education*. (2<sup>nd</sup> ed). Prentice Hall of India Private Limited. New Delhi (ISBN:978-81-203-8).
- Hentry E Garrett – Statistics in Psychology & Education
- J.F. Guilford Fundamentals of Statistics in Psychology & Education- McGrawHill
- S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan

Chand and Sons.

- Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad.

**Note: The 5 marks for the Assignment component of Internal assessment may be given for solving problems from the above syllabus.**

**Competencies of the course:**

- Decisions in the face of uncertainty
- Explain the concepts of Probability distributions

**Blue Print – ST2C03B18 –Probability and Probability Distributions**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	4	2
II	4	3	1
III	5	2	1

## Complementary Course to B. Sc. Psychology

### Semester IV –Course IV

#### ST4C02B18- TESTING OF HYPOTHESES

- Objectives :**
- 1) To introduce the concept of research and testing
  - 2) To develop the knowledge of testing in experiments in students

**Course Overview and Context:**

This course enables the students to make decisions regarding the results of an experiment.

#### Syllabus Content

**Credits -2**

**Hours per week – 3, Total – 54 hours**

#### Module I (17 Hours)

Testing of hypothesis- Statistical hypothesis, Simple and composite hypothesis Null and Alternate hypothesis, Type I and Type II errors, Critical Region, Size of the test, P value.

#### Module II (17 Hours)

Large sample tests - z-tests for means, difference of means, proportion and difference of proportion, chi-square tests for independence, homogeneity

#### Module III (20 Hours)

Small Sample Tests-Normal tests for mean, difference of means and proportion (when  $\sigma$  known), t-tests for mean and difference of means (when  $\sigma$  unknown), paired t-test, test for proportion (binomial), chi-square test for variance, F-test for ratio of variances.

#### Core Reference:

- Gupta.S.P., Statistical Methods. Sulthan Chand and Sons New Delhi.

#### Additional References

- Aron, A., Aron. R., & Coups, E. J. (2006). *Statistics for Psychology*. (4<sup>th</sup> ed). New Delhi: Pearson Education (ISBN: 81-317-1464-20).
- Mangal, S. K. (2002). *Statistics in Psychology and Education*. (2<sup>nd</sup> ed). New Delhi: Prentice Hall of India Private Limited.(ISBN:978-81-203-8).
- Hentry E Garrett – Statistics in Psychology & Education
- J.F. Guilford Fundamentals of Statistics in Psychology & Education- McGrawHill
- S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons.

- Fundamentals of Statistics: DN Elhance, KitabMahal , Allahabad.

**Note: The 5 marks for the Assignment component of Internal assessment may be given for solving problems from the above syllabus.**

**Competencies of the course:**

- Describe the procedure of testing of hypotheses
- Explain standard error and testing procedures for parameters of a Normal population using large and small samples

**Blue Print - ST4C02B18 – Testing of Hypotheses**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	3	1
II	4	3	2
III	5	3	1

**Complementary Course for B.Voc. (Software Development)**  
**Semester III**  
**ST3C04B18 – Basic Statistics and SPSS**

**Objectives:**

1. To introduce basic concepts in Statistics
2. To explain different techniques used in a statistical investigation.
3. To familiarize statistical tools MS Excel and SPSS

**Course Overview and Context:** This course covers the basics of Statistics. The idea is to provide the students with the basic understanding of the subject and also introduce Statistical package (SPSS).

**Syllabus Content**

**Credits -4**

**Hours per week – 4, Total – 72 hours**

**Module I**

**(10 Hours)**

Data and its organization: Data - Sources of data - Types of data - Collection of data  
Tabulation–frequency distribution - graphic representation- Histogram, frequency polygon, frequency curve, ogives  
Analysis of Data: Measures of Central Tendency - Mean, Median and Mode. Requisites for an ideal measure of central tendency. Measures of Variation - Range, Quartile deviation, Mean deviation, Standard deviation & Coefficient of variation, Characteristics of an ideal measure of dispersion. Concepts of correlation and regression. Scatter diagram, Correlation table, correlation coefficient, regression coefficient, linear regression and prediction(Theory only)

**Module II**

**(20 Hours)**

Interpretation of Data: Normal distribution - Importance and properties of Normal distribution.  
Theory of attributes - introduction, independence of attributes, criterion of independence, association of attributes, Yule's coefficient of association, coefficient of colligation.  
Tests of significance- Null Hypothesis, level of significance, confidence interval, large sample tests for single proportion, single mean and difference of means, difference of standard deviations. Small sample tests-t test and F' test-t test of significance for single mean, paired t - test for related samples, difference in means and observed correlation coefficients, F test of significance for equality of population variances. - Chi square - test of goodness of fit, independence of attributes.

### **Module III**

**(20 Hours)**

Data Handling using Excel: Getting started with Using functions - Statistical Functions – Frequency, Average, Median, Mode, Quartile, Standard Excel - Work Book and Work Sheet – Moving around in a work sheet - Building a work sheet working with more than one cell at a time - Formula and rules for using formula - Functions - Deviation, Variance, Correlation, Chi test - Printing Data and Results. Charts: Column- Pie- XY (Scatter) - Frequency Polygon, Frequency curve - Ogives- Formatting Charts - Printing Charts. Data Analysis Using Excel: Frequency Distribution – Histogram - Descriptive Statistics Correlation - Regression. Inferential Statistics: Statistical Tests: Testing a mean, t-test for a mean, two sample Z test for Means- Two sample t-test for means, Paired t- test, Chi-square test for Variance, Goodness of fit, Independence of Attributes.

### **Module IV**

**(22 Hours)**

Introduction to SPSS and its Applications: Defining variables - Numeric and String Variables – Assigning Names and Labels to variables and values - Entering Data - Summary Statistics – Frequencies - Descriptive Statistics Means - Crosstab - Graphs - Histograms and Bar charts- Scatter diagram, Pie Diagram - Bivariate Correlation - Linear regression - Test of mean - One Sample t-test, Independent sample t-test- Paired samples t-test – Chi-square test.

### **References**

- Scientific Methods and Social Research - Gosh, B.N.- Sterling Publishers Pvt. Ltd. New Delhi,
- Research Methodology, Methods and Techniques - Kothari, C.R. Wiew Eastern Limited, New Delhi, 1990.
- Research Methods in Social Science -Sharma, B.A.V. Prasad RD. and Satyanarayana, P. Sterling Publishers Pvt. Ltd, 1985.
- Methodology and Techniques of Social Research - Wilkinson, T.S. and Bhandarkar, P.L.Himalaya Publishing House, Bombay, 1984.
- Statistical Methods - Agarwal. Y.P. - Sterling Publishers Pvt. Ltd, 1990.
- Statistical Methods - Gupta. S.P. Sultan Chand & Sons, New Delhi, 1996.
- Statistical Methods for Biologists - Palanisamy S. and Manobaran M.Paramount Publications, Palani, 1991.
- Statistics Theory, Methods and Application - Sancheti, D.C. and. Kapoor.V.K. - Sultan Chand & Sons, New Delhi, 1993.
- Methods in Bio Statistics for medical students & Research workers - B.K. Mahajan - Jaypee Brothers.
- An Introduction to Bio Statistics (A manual for students in Health Science) - P.S.S. Sundar Rao & J. Richard - Prentice Hall of India

- Statistics made simple - Do it yourself on PC - K.V.S Sharma - Prentice Hall of India, New Delhi.
- A first Course in Computers - Sanjay Saxena - Vikas publishing house Pvt. Ltd.
- Microsoft Office 2003 Bible - Edward C. Willett - Wiley Publishing, Inc.
- Microsoft Office Excel 2003, A Beginners Guide - Guy Hart - Davis - dream tech Press.
- Introduction to Computers & MS Office - Sanjay Saxena - Vikas Publishing House Pvt. Ltd.
- SPSS Explained - Perry R. Hinton, Charlotte Brownlow, Isabella Mc Murray and Bob Cozens - Routledge Taylor and Francis Group, London & New York.

**Competencies of course:**

- Understand the basic concepts in Statistics as well as different steps in a statistical investigation.
- Choose appropriate test for a given Statistical problem.
- Use MS Excel and SPSS to carry out statistical tests.

**Blue Print – ST3C04B18 – Basic Statistics and SPSS**

Module	Part A 2Marks 10/12	Part B 5 Marks 6/9	Part C 15 Marks 2/4
I	3	3	1
II	3	3	1
III	4	2	1
IV	2	1	1