

JECRC University
Department of Mathematics
Minutes of the meeting

Date: 26th April, 2018

A meeting of Board of Studies (Mathematics) held on 26th April, 2018 at 10:00 AM to revise the syllabi of B.Sc. Mathematics and Statistics course and M.Sc. Mathematics course in JECRC University.


The meeting was chaired by Dr. Jagdev Singh and external member of the BOS (Mathematics) meeting was Prof. K. C. Jain (Professor of Mathematics, MNIT, Jaipur) and attended by the following members:

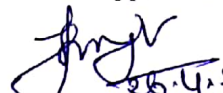
1. Prof. R. P. Sharma
2. Dr. Devendra Kumar
3. Dr. Deepa Mordia
4. Dr. Monika Jain
5. Dr. Vishwas Deep Joshi

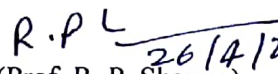
Various decisions were taken and several issues were discussed at length and following decision was taken unanimously:

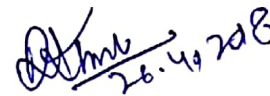
(i) The revised codes and revised syllabi for M.Sc. Mathematics course for session 2018-2020 were approved. The revised course contents were incorporated in the enclosed document.

(ii) The revised codes of B.Sc. (Mathematics & Statistics) for session 2018-2021 were also approved.

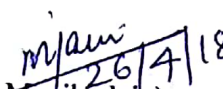

(Prof. K.C. Jain) 26/4/2018

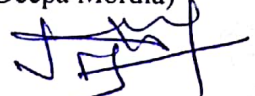

(Dr. Jagdev Singh) 26.4.2018


(Prof. R. P. Sharma) 26/4/2018


(Dr. Devendra Kumar) 26.4.2018


(Dr. Deepa Mordia)


(Dr. Monika Jain) 26/4/18


(Dr. V. D. Joshi)



JECRCTM
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Department of Mathematics and Statistics

Course Structure and Syllabi

B.Sc Statistics Course

Session 2018-21

Statistics

Objectives of the Course

This course is designed to provide the science student an intense foundational introduction to the fundamental concepts in Statistics. The course continues the introduction to the student started in Statistics to many branches of Sciences and concentrates on pertinent and concrete examples and applications. After completing the course the student should be able to work basic problem and word problems in probability, and statistics.

It is imperative to know the importance and scope of the discipline, to inculcate interest in statistics to impart knowledge of science as the basic objective of Education, to develop a scientific attitude to make students open minded, to develop an ability to work on their own and to make them fit for the society, to expose themselves to the diversity amongst life forms, to develop skill in practical analysis along with collection and interpretation of statistical materials and data, to develop an ability for the application of the acquired knowledge in the fields of statistics so as to make our country self reliant and self sufficient and to make them able to appreciate and apply ethical principles to statistical research and studies. The science/ mathematics/ engineering/ business student should have mastered and demonstrated the following quantitative skills after completing Statistics

B.Sc. Statistics Minor

Semester I						
Course Code	Paper Type	Subject	L	T	P	Credits
BST001B	F	Descriptive Statistics-I	4	0	0	4
BST002C	C	Practical- I	0	0	2	1
Total						5
Semester II						
BST003D	F	Descriptive Statistics-II	4	0	0	4
BST004B	C	Practical- II	0	0	2	1
Total						5
Semester III						
BST005B	C	Statistical Inference	4	0	0	4
BST006B	C	Practical- III	0	0	2	1
Total						5
Semester IV						
BST007B	S	Sampling Distribution	4	0	0	4
BST008B	ID	Practical- IV	0	0	2	1
Total						5
Semester V						
BST009B	S	Survey Sampling	4	0	0	4
BST010B	ID	Practical- V	0	0	2	1
Total						5
Semester VI						
BST011B	S	Design of Experiments	4	0	0	4
BST012B	ID	Practical- VI	0	0	2	1
Total						5

Grand Total 30

C- Core
S-Specialization

F- Foundation
ID- Interdisciplinary G-General

Program Specific Outcome: B.Sc. Statistics program

PSO1: The graduates will become successful professionals by demonstrating logical and analytical thinking abilities.(Professional Skills)

PSO2: The graduates will work and communicate effectively in inter-disciplinary environment, either independently or in a team, and demonstrate leadership qualities.(Problem-Solving Skills)

PSO3: The graduates will engage in life-long learning and professional development through self-study, continuing education or professional and doctoral level studies.(Successful Career and Entrepreneurship)

Program Outcome(PO's)

Upon completion of the **B.Sc. Statistics** program, students will be able to:

PO1.**Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2.**Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. **Social Interaction:** Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. **Effective Citizenship:** Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. **Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. **Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.

PO7. **Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio technological changes

Semester –I

BST001B	Descriptive Statistics-I	4-0-0 [4]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of collection of data.
- To develop an understanding tools of statistics.

UNIT 1	<p>Meaning of Statistics. Importance of Statistics. Scope of Statistics: In Industry, Biological Sciences, Medical Sciences, Economics, Social Sciences, Management Sciences, Agriculture, Insurance, Information technology, Education and Psychology. Limitations. Types of data : Collection of primary and secondary data.</p> <p>Organization of data : Qualitative and Quantitative classification, discrete and continuous classification, Geographical and Chronological classification. Construction of frequency tables, frequency distribution for continuous and discrete data, cumulative frequency distributions (inclusive and exclusive methods). Graphical presentation of data: Histogram, Frequency Polygon, Frequency curve and Ogives</p>
UNIT 2	<p>Measures of central tendency: Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.), Mode and Median: Definition, effect of change of origin and scale. Formulae (for ungrouped and grouped data), merits and demerits. Empirical relation between mean, median and mode (without proof) merits and demerits.</p> <p>Measure of Dispersion- Definition, different measures of Dispersion, simple properties, merits and demerits. Coefficient of variation.</p>
UNIT 3	<p>Skewness, Kurtosis and moments : Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution. Bowley's coefficient of skewness: Bowley's coefficient of skewness, Karl Pearson's coefficient of skewness. Measures of skewness Concepts of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions. Measures of kurtosis based on moments (β_2, γ_2). Raw moments (m'_r) for ungrouped and grouped data. Central moments (m_r) for ungrouped and grouped data,</p>
UNIT 4	<p>Probability: Random experiment, trial, sample point and sample space, events, operations of events, concepts of equally likely, mutually exclusive and exhaustive events.</p>
UNIT 5	<p>Definition of probability: Classical, relative frequency and axiomatic approaches. Discrete probability space, properties of probability under set theoretic approach. Independence of events, Conditional probability, total and compound probability theorems, Baye's theorem and its applications. Joint, marginal and conditional probability.</p>

Text Books:

S.P. Gupta : Statistical Methods, Sultan Chand & Sons. First edition.

Reference Books:

1. Goon A.M., Gupta M.K., Dasgupta B. Fundamentals of Statistics, Volume I, The World Press Private Limited, Calcutta. Fifth edition.
2. Shah R.J.: Descriptive Statistics, Seth Publications. Eighth edition.
3. Spiegel, M.R.: Theory and Problems of Statistics, Schaum's Publishing Series. Tata McGraw-Hill. First edition.
4. Welling, Khandeparkar, Pawar, Naralkar : Descriptive Statistics : Manan Prakashan

5. S.P. Gupta: Statistical Methods, Sultan Chand & Sons. First edition.
6. Prem . S. Mann (2007). Introductory Statistics (6th edition) John Wiley & Sons.
7. Allan Bluman (2009) Introductory Statistics. A step by step approach (7th edition). McGraw-Hill

Course Outcomes

CO1:-Understanding the difference between primary and secondary data.

CO2:-Understanding the basics concepts of Mean, median, mode and other statistical tools of dispersion

CO3:- Understanding the basics concepts of moments

CO4:-Understanding the various techniques to calculate skewness kurtosis

CO5:-Developing the ability to understand karl pearson methods

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	M	M	L	M	M	M	H	M	M	H
CO2	H	H	L	L	M	L	H	M	M	H
CO3	M	M	M	L	L	L	H	H	H	M
CO4	L	M	M	L	L	L	H	H	M	M
CO5	H	M	M	L	M	M	H	M	M	H

H = Highly Related; M = Medium L = Low

BST002C	Practical- I	1-0-0 [1]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Presentation of data
- To develop an understanding of Dispersion

List of programs

- Introduction to graphical presentation data
- Computations with Measures of central tendency
- To deal with measures of dispersion
- Solving system of moments
- Find the values of probability

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books:

1. Goon A.M., Gupta M.K., Dasgupta B. Fundamentals of Statistics, Volume I, The World Press Private Limited, Calcutta. Fifth edition.
2. Shah R.J.: Descriptive Statistics, Seth Publications. Eighth edition.
3. Spiegel, M.R.: Theory and Problems of Statistics, Schaum's Publishing Series. Tata McGraw-Hill. First edition.
4. Welling, Khandeparkar, Pawar, Naralkar : Descriptive Statistics : Manan Prakashan
5. S.P. Gupta : Statistical Methods, Sultan Chand & Sons. First edition.
6. Prem . S. Mann (2007). Introductory Statistics (6th edition) John Wiley & Sons.
7. Allan Bluman (2009) Introductory Statistics. A step by step approach (7th edition). McGraw-Hill
8. Meyer, P.: Introductory Probability and Statistical Applications. Addison Wesley
9. Stirzeker David (1994): Elementary Probability, Cambridge University Press.
10. Mukhopadhyay, P: Mathematical Statistics, New Central Book Agency.

Course Outcomes

CO1:- To understand the Basic requirement of measures of location

CO2:-Understanding the basics concepts of organizing data

CO3:- Understanding the applications of dispersion

CO4:- Understanding the various methods to Moments

CO5:- Understanding the various Laws and concepts of probability

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		M		M			H	M	M	H
CO2	H	H					H		M	H
CO3	M						H	H	H	
CO4							H	H		
CO5	H						H			H

H = Highly Related; M = Medium; L = Low

Semester II

BST003D	Descriptive Statistics-II	4-0-0 [4]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Correlation and regression
- To develop an understanding of time series in statistics

UNIT 1	Theory of Attributes: Classes and class frequencies, order of class frequencies, Ultimate class frequency, Consistency of data (up to order 3). Independence of attributes, contingency table, Association of attributes, Measures of association.
UNIT 2	Correlation and Regression: Correlation, Scatter Diagram, Karl Pearson's Coefficient of Correlation and its properties. Spearman's Rank Correlation Coefficient. Regression-Fitting of Regression Lines, Regression Coefficients with properties.
UNIT 3	Time Series: Introduction, decomposition of a time series, different components with illustrations. Additive and multiplicative models. Different methods of determining trend and seasonal fluctuations, their merits and demerits. Measurement of trend-Graphical Method, Method of Semi-averages . Measurement of trend-Method of fitting curve ,Method of Moving Averages. Measurement of seasonal variation- Method of Simple Averages, Ratio to Trend Method
UNIT 4	Univariate Probability Distributions: Uniform, Binomial, Poisson, Hypergeometric, Geometric and Negative Binomial with simple properties and applications. Fitting of Binomial and Poisson distribution. Normal and Poisson distributions as limiting case of binomial distribution
UNIT 5	Continuous probability distributions: Normal, Exponential, Gamma, Beta distributions, Cauchy, Log normal Distributions with simple properties and applications.

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, S Chand and Company, New Delhi

Reference Books:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand and Company, New Delhi
3. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition .
4. Speigel M.R., (1967): Theory and Problem of Statistics, Schaum's Publishing Series. 3. Gupta, O.P.: Mathematical Statistics, Kedarnath Publication, Meerut
5. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): An Outline of Statistics Volume II, The World Press Pvt Ltd, Calcutta

Course Outcomes

CO1:- To understand the Basic requirement of theory attributes.

CO2:-Understanding the basics concepts of curve fitting.

CO3:- Understanding the basics concepts of Correlation and regression.

CO4:-Understanding the various methods to determine trends.

CO5:-Developing the ability to understand method of simple and moving averages.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	M	M	L	M	H	L	H	M	H	H
CO2	H	H	H	L	H	L	H	H	H	H
CO3	H	H	H	L	H	L	H	H	H	H
CO4	H	H	H	L	H	L	H	H	H	H
CO5	M	H	H	L	H	M	H	M	M	M

H = Highly Related; M = Medium L = Low

BST004B	Practical- II	1-0-0 [1]
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OBJECTIVE:

- To understand the Basic requirement of Correlation
- To describe methods of Time series
- To develop an understanding of probability distribution

List of programs

- Introduction to attributes
- Computations with correlation
- To deal with regression problems
- Solving system of time series
- Find the values probability distribution

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand and Company, New Delhi
3. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition .
4. Speigel M.R., (1967): Theory and Problem of Statistics, Schaum's Publishing Series. 3. Gupta, O.P.:Mathematical Statistics, Kedarnath Publication, Meerut
5. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): An Outline of Statistics Volume II,The World Press Pvt Ltd, Calcutta
6. Jain, M.K., Iyengar, SRK and Jain R.K.: Numerical Methods For Scientific And Engineering Computations; NEW AGE International (P) Limited.
7. S.S. Sastry : Introductory Methods of Numerical Analysis; Prentice Hall of India Pvt. Limited.
8. Saxena, H.C : Calculus of Finite Differences ,S. Chand and Company,New Delhi.

Course Outcomes

CO1:- To understand the Basic requirement of attributes

CO2:-Understanding the basics concepts of correlation

CO3:- Understanding the applications of regression

CO4:-Understanding the various methods to calculate time series

CO5:- Understanding the various probability distribution

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1							H			
CO2		H								H
CO3				H				H	H	
CO4							H	H		
CO5	H						H			H

H = Highly Related; M = Medium; L = Low

Semester III

BST005B	Statistical Inference	4-0-0 [4]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Sampling distribution
- To develop an understanding of Chi-square ,t and F-Distribution in statistics

UNIT 1	Random variables – discrete and continuous, probability mass function (pmf) and probability density function (pdf), Cumulative distribution function (cdf). Mathematical Expectation: Expectation of a random variable and its simple properties. Addition and Multiplication theorems of Expectations. Variance and covariance and their properties.
UNIT 2	Statistical Hypothesis and test of significance I Definition, Simple and Composite hypotheses. Null and Alternative Hypotheses, two Types of errors in sampling ,critical region , level of significance critical and p-values, procedure and testing of hypothesis.
UNIT 3	Statistical Hypothesis II: one tailed and two tailed test, Power and size of the test, and critical region Neyman Pearson Lemma and its application for finding BCR. Estimation: Parametric space, sample space, point estimation. Requirements of good estimator: Consistency, unbiasedness, efficiency, sufficiency and completeness.
UNIT 4	Minimum variance unbiased (MVU) estimators. Cramer-Rao inequality. Minimum Variance Bound (MVB) estimator, Rao-Blackwell theorem, Lehmann-Scheffe theorem.
UNIT 5	Convergence in Probability: Weak Law of Large Numbers and its applications, Convergence in Distribution, De-Moivre Laplace limit theorem, Statement of Central Limit Theorem (i.i.d. case) & its applications.

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books:

1. Casella, G. and Berger, Roger L.: Statistical Inference, Duxbury Thompson Learning , Second Edition.
2. Gibbons, J. Dickinson and Chakraborty, S.: Nonparametric Statistical Inference, CRC, Fourth Edition.
3. Goon, A.M., Gupta, M.K. and Dasgupta, B. Das (1991): An Outline of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
4. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi.
5. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company ,Third Edition
6. Rohatgi, V.K.(1967): An Introduction to Probability Theory and Statistics, John Wiley And Sons.
7. Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods, Iowa State University Press.
8. Kantiswarup, Gupta, P.K. and Manmohan (2008): Operations Research, 13th Edn. Sultan Chand and Sons.
9. Sharma, S.D. (2009): Operations Research-Theory, Methods and Applications, 16th Revised Edn., Kedar Nath Ram Nath.
10. Taha, H.A. (2007): Operations Research: An Introduction, 8th Edn. Prentice Hall of India.

Course Outcomes

CO1:- To understand the Basic requirement of Hypothesis

CO2:-Understanding the basics concepts of test of significance

CO3:- Understanding the applications of Estimation

CO4:-Understanding the various methods to MVUE

CO5:-.. Understanding the various Laws of large number

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	M	M	L	M	L	L	M	M	H	H
CO2	H	H	L	H	L	H	H	H	H	H
CO3	H	H	L	H	L	H	H	H	H	H
CO4	M	H	L	H	L	H	H	H	H	H
CO5	H	H	L	H	L	M	L	M	M	M

H = Highly Related; M = Medium L = Low

BST006B	Practical- III	1-0-0 [1]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Random variable
- To develop an understanding of estimation

List of programs

- Introduction to Random variables
- Computations with Mathematical Expectation
- To deal with statistical hypothesis
- Solving system of equation and estimation
- Find the values of MVUE

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books:

1. Gupta, O.P.: Mathematical Statistics, Kedarnath Publication, Meerut
2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): An Outline of Statistics Volume II, The World Press Pvt Ltd, Calcutta
3. Croxton, F.E., Cowden, D.J. and Klein, S. (1982): Applied General Statistics, 3rd Edn. Prentice Hall of India (P) Ltd.
4. Duncan, A.J. and Erwin, R.D. (1974): Quality Control and Industrial Statistics, 4th Edn. Taraporewala and Sons.
5. Elhance, D. N. and Elhance, V. (1996): Fundamentals of Statistics. D.K. Publishers.
6. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
7. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Course Outcomes

CO1:- To understand the Basic requirement of Hypothesis

CO2:-Understanding the basics concepts of test of significance

CO3:- Understanding the applications of Estimation

CO4:-Understanding the various methods to MVUE

CO5:- Understanding the various Laws of large number

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1							H	M	M	H
CO2	H	H				H				
CO3	H						H	H	H	
CO4							H	H		
CO5	H						H			H

H = Highly Related; M = Medium; L = Low

Semester IV

BST007B	<u>Sampling Distributions</u>	4-0-0 [4]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Statistical quality control
- To develop an understanding of Chi-square, t and F-Distribution in statistics

UNIT 1	Chi-square Distribution: Definition, Derivation of pdf, Moments, Moment Generating Function, Cumulant Generating Function. Limiting and Additive property of Chi-square variates. Distribution of ratio of chi-square variates
UNIT 2	t-Distribution: Definition of Student's-t and Fisher's-t statistic and derivation of their distributions. Limiting property of t-distribution. Applications: Testing of single mean, Difference of two means, paired t-test and sample correlation coefficient.
UNIT 3	F-Distribution: Definition of Snedecor's F-distribution and its derivation. Application-Testing of equality of two variance. Fisher's transformation and its uses. Relationship between 't' and 'F' statistics and between 'F' and chi-square statistic.
UNIT 4	Statistical Quality Control (S.Q.C.): Its concept, application and importance. Process and Product Controls, causes of variations in quality-control limits and their justification. Theory of control charts for variables and attributes: \bar{x} , R, s, p, np and c. Natural Tolerance Limits. Specification Control Limits and Modified Control Limits.
UNIT 5	Sampling Inspection Plans- Acceptance-Rejection and Acceptance-Rectification plans, concepts, Acceptance Quality level (AQL), Lot Tolerance Percent Defective (LTPD), Process Average Fraction Defective, Producer's Risk, Consumer's Risk, Average Outgoing Quality (AOQ), Average Outgoing Quality Limit (AOQL), Operating Characteristic (OC) curve, Average Sample Number (ASN) Curve and Average Amount of Total Inspection (ATI) Curve.

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books:

Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta

1. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi
2. Mood Alexander M., Graybill Frankline and Boes Duane C.: Introduction to Theory of Statistics, Mc Graw Hill & Company Third Edition
3. Speigel M.R., (1967): Theory and Problem of Statistics, Schaum's Publishing Series.
4. Gupta, O.P.: Mathematical Statistics, Kedarnath Publication, Meerut
5. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): An Outline of Statistics Volume II, The World Press Pvt Ltd, Calcutta

Course Outcomes

- CO1:-Understanding the applications of Chi-square -distribution.
CO2:- Understanding the various methods to T-distribution.
CO3:- Understanding the various methods to F-distribution
CO4:- Understanding the applications of statistical quality control
CO5:- Understanding the applications of sampling inspection plan

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES
AND PROGRAM SPECIFIC OUTCOMES:**

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	M	M	L	M	L	L	M	M	H	H
CO2	H	H	L	H	L	H	H	H	H	H
CO3	H	H	L	H	L	H	H	H	H	H
CO4	M	H	L	H	L	H	H	H	H	H
CO5	H	H	L	H	L	M	L	M	M	M

H = Highly Related; M = Medium L = Low

BST008B	Practical- IV	1-0-0 [1]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Distribution
- To develop an understanding of inspection plans

List of programs

- Introduction to Distribution
- Computations with Chi square distribution
- Computations with t- distribution
- Computations with F- distribution
- How to deal with sampling inspection plans

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Reference Books:

1. Gupta, O.P.: Mathematical Statistics, Kedarnath Publication, Meerut
2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): An Outline of Statistics Volume II, The World Press Pvt Ltd, Calcutta
3. Croxton, F.E., Cowden, D.J. and Klein, S. (1982): Applied General Statistics, 3rd Edn. Prentice Hall of India (P) Ltd.
4. Duncan, A.J. and Erwin, R.D. (1974): Quality Control and Industrial Statistics, 4th Edn. Taraporewala and Sons.
5. Elhance, D. N. and Elhance, V. (1996): Fundamentals of Statistics. D.K. Publishers.
6. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1991): Fundamentals of Statistics, Volume II, The World Press Pvt Ltd, Calcutta
7. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, S Chand & Company, New Delhi

Course Outcomes

CO1:-Understanding the applications of Chi-square -distribution.

CO2:- Understanding the various methods to T-distribution.

CO3:- Understanding the various methods to F-distribution

CO4:- Understanding the applications of statistical quality control

CO5:- Understanding the applications of sampling inspection plan

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1							H			H
CO2	H	H				H				
CO3	H								H	
CO4								H		
CO5	H						H			H

H = Highly Related; M = Medium; L = Low

Semester V

BST009B	<u>Survey Sampling</u>	4-0-0 [4]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Sampling.
- To develop and understand sampling methods

UNIT 1	Sample Surveys: Concepts of Population and sample. Complete enumeration vs sampling. Need for sampling. Principal and organizational aspects in the conduct of a sample survey.
UNIT 2	Basic sampling methods: Simple random sampling with or without replacement for the estimation of mean, total, proportion and ratio. T1 and T2 classes of Linear estimators and minimum variance. Determination of sample size. Probability proportional to size sampling (with replacement).
UNIT 3	Stratified random sampling: Different allocations. Post-stratification, Method of collapsed strata. Ratio method of estimation, optimality of ratio estimator. systematic sampling ,Cluster sampling with equal size of clusters Non sampling errors
UNIT 4	Index Numbers: Definition, construction of index numbers by different methods, Problems faced in their construction, criterion of a good index number-Test Theory-unit, time reversal, factor reversal and circular tests. Errors in the construction of index numbers. Chain and Fixed base index numbers. Base Shifting, Splicing and Deflating of index numbers. Cost of Living Index numbers- construction and uses. Wholesale Price Index and Index of Industrial Production.
UNIT 5	Mortality and Life Table: Measurement of Mortality and Life Table, Crude death rate, Standardized death rates, Age-specific death rates, Infant Mortality rate, Death rate by cause, Complete life table and its main features, Uses of life table. Measurement of Fertility: Crude birth rate, general fertility rate, age specific birth rate, total fertility rate, gross reproduction rate, net reproduction rate. Vital statistics: Method of obtaining vital statistics its uses. Measurement of population , Rates and ratio of vital events,

Text Books:

Gupta, S.C. and Kapoor, Fundamentals of Applied Statistics, S Chand & Company, New Delhi.

Reference Books:

1. Cochran, W.G. (1977): Sampling Techniques. John wiley and Sons, N.Y.
2. Murthy, M.N. (1967): Sampling Theory and Methods. Statistical Publishing Society, Kolkata.
3. Raj, D. and Chandhoke, P. (1998): Sample Survey Theory. Narosa Publishing house.
4. Singh, D. and Chaudhary, F.S. (1995): Theory and Analysis of Sample Survey Designs. New Age International (P) Ltd.
5. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. (1984): Sampling Theory of Surveys with Applications. Iowa State University Press, Iowa, USA.
6. Croxton, F.E., Cowden, D.J. and Klein, S. (1982): Applied General Statistics, 3rd Edn. Prentice Hall of India (P) Ltd.
7. Gupta, S.C. and Kapoor, V.K. (2008): Fundamentals of Applied Statistics, 4th Edn., (Reprint),Sultan Chand and Sons.

8. Soni, R.S. (1996): Business Mathematics with Application in Business and Economics. Pitamber Publishing Co.
9. Mukhopadhyay, P. (1994) :Applied Statistics, new Central Book Agency Pvt. Ltd., Calcutta.
10. Srivastava O.S. (1983) : A Text Book of Demography, Vikas Publishing House, new Delhi.
11. Benjamin B. (1959): Health and Vital Statistics, Allen and Unwin.
12. Goon A.M., Gupta M.K. and Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
13. Duncan A.J. (1974) : Quality Control and Industrial Statistics, IV Edision, Taraporewala and Sons.
14. Montgomery, D.C. (1991): Introduction to the Statistical Quality Control, IInd Editions, John Wiley and Sons.
15. Brown R.G. (1963): Smoothing, Forecasting and Prediction of Discrete Time Series, Prentice Hall.
16. Chatfield C. (1980) : The Analysis of Time Series, IInd Edition Chapman and Hall.

Course Outcomes

CO1:- To understand the Basic concepts of sample survey

CO2:-To Understanding the basics concepts of Basic sampling method

CO3:- Understanding the basics concepts of Stratified random sampling

CO4:- Understanding the basics concepts of Index number

CO5:- Understanding the various techniques to calculate life table

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	H	H	M	M	L	H	H	H	H	H
CO2	H	H	M	M	L	M	H	H	H	H
CO3	H	H	L	M	M	M	H	H	H	H
CO4	H	H	L	L	M	M	M	H	H	M
CO5	M	M	L	L	M	M	M	M	H	M

H = Highly Related; M = Medium L = LOW

BST0010B	Practical- V	1-0-0 [1]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of Sample survey
- To develop an understanding of index numbers

List of programs

- Introduction to Sample survey
- Computations with Simple random sampling
- Computations with SRSWOR
- Computations with Stratified sampling
- How to deal with Index numbers

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, S Chand & Company, New Delhi

Books suggested:

1. Allen, R.G.D. (1995): Mathematical Analysis for Economist. Macmillan.
2. Ayer, Frank. (1983): Theory and Problems of Mathematics of Finance (Schaum's Outline Series), Mc Graw Hill Book Company, Singapore
3. Benjamin B. (1959): Health and Vital Statistics, Allen and Unuwin.
4. Goon A.M., Gupta M.K. and Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
5. Duncan A.J. (1974) : Quality Control and Industrial Statistics, IV Edision, Taraporewala and Sons.
6. Singh, D. and Chaudhary, F.S. (1995): Theory and Analysis of Sample Survey Designs. New Age International (P) Ltd.
7. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. (1984): Sampling Theory of Surveys with Applications. Iowa State University Press, Iowa, USA.

Course Outcomes

- CO1:- To understand the Basic concepts of sample survey
CO2:-To Understanding the basics concepts of Basic sampling method
CO3:- Understanding the basics concepts of Stratified random sampling
CO4:- Understanding the basics concepts of Index number
CO5:- Understanding the various techniques to calculate life table

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome							C		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1							H			H
CO2	H	H				H				
CO3									H	
CO4			H					H		
CO5							H			

H = Highly Related; M = Medium; L = Low

Semester VI

BST011B	<u>Design of Experiments</u>	4-0-0 [4]
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OBJECTIVE:

- To understand the Basic requirement of ANOVA
- To describe methods of Experimental design
- To develop and understand non parametric test

UNIT 1	Analysis of variance: One-way and two-way classified data for fixed effects models. Analysis of Covariance: One-way and two-way classified data with one concomitant variable.
UNIT 2	Experimental designs: Role, historical perspective, terminology, experimental error, basic principles, uniformity trials, fertility contour maps, choice of size and shape of plots and blocks. Basic designs: Completely Randomized Design (CRD),
UNIT 3	Randomized Block Design (RBD), Latin Square Design (LSD) – layout, model and statistical analysis, relative efficiency, analysis with missing observations.
UNIT 4	Incomplete Block Designs: Balanced Incomplete Block Design (BIBD) – parameters, relationships among its parameters Factorial experiments: advantages, notations and concepts, 2^2 and 3^2 .
UNIT 5	Non Parametric Tests: Definition merits and limitations, Sign test for univariate and bivariate distributions, Run test and Median test for small and large samples.

Text Books:

Gupta, S.C. and Kapoor, V.K Fundamentals of Applied Statistics, S Chand & Company, New Delhi.

Reference Books:

1. Chandra T.K. (1999): A First Course in Asymptotic Theory in Statistics, Narosa
2. Goon A.M., Gupta M.K. & Dasgupta B. (1994): An Outline of Statistical Theory (Vol-1 and 2), World Press
3. Hogg R.V. & Craig A.T. (1978): Introduction to Mathematical Statistics
4. Serfling R.J. (1980): Approximation Theory of Mathematical Statistics, John Wiley
5. Cochran, W.G. and Cox, G.M. (1959): Experimental Design. Asis Publishing House.
6. Das, M.N. and Giri, N.C. (1986): Design and Analysis of Experiments. Wiley Eastern Ltd.
7. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005): Fundamentals of Statistics. Vol. II, 8th Edn. World Press, Kolkata.
8. Kempthorne, O. (1965): The Design and Analysis of Experiments. John Wiley.
9. Montgomery, D. C. (2008): Design and Analysis of Experiments, John Wiley.

Course Outcomes

1. CO1:- To understand the Basic concepts of Experimental design
2. CO2:-To Understanding the basics concepts Of CRD
3. CO3:- Understanding the basics concepts of RBD,LSD
4. CO4:- Understanding the basics concepts of BIBD
5. CO5:- Understanding the various techniques to calculate Fcatorial experiment

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

<i>Course Outcome</i>	Program Outcome							Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	H	H	M	M	L	H	H	H	H	H
CO2	H	H	M	M	M	M	H	H	H	H
CO3	H	H	M	M	M	M	H	H	H	H
CO4	H	H	M	L	M	M	M	H	H	M
CO5	M	M	M	L	M	M	M	M	H	M

H = Highly Related; M = Medium L = Low

BST0012B	Practical- VI	1-0-0 [1]
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OBJECTIVE:

- To understand the Basic requirement of statistics to society
- To describe methods of ANOVA
- To develop an understanding of Factorial experiments

List of programs

- Introduction to ANOVA
- Computations with one way analysis
- Computations with Two way analysis
- Computations with CRD
- Computations with RBD
- Computations with LSD
- Computations with BIBD
- How to deal with Factorial experiments

Text Books:

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, S Chand & Company, New Delhi

Books suggested:

1. Allen, R.G.D. (1995): Mathematical Analysis for Economist. Macmillan.
2. Ayer, Frank. (1983): Theory and Problems of Mathematics of Finance (Schaum's Outline Series), Mc Graw Hill Book Company, Singapore
3. Benjamin B. (1959): Health and Vital Statistics, Allen and Unuwin.
4. Goon A.M., Gupta M.K. and Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press, Calcutta.
5. Duncan A.J. (1974): Quality Control and Industrial Statistics, IV Edision, Taraporewala and Sons.
6. Singh, D. and Chaudhary, F.S. (1995): Theory and Analysis of Sample Survey Designs. New Age International (P) Ltd.
7. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. (1984): Sampling Theory of Surveys with Applications. Iowa State University Press, Iowa, USA.

Course Outcomes

1. CO1:- To understand the Basic concepts of Experimental design
2. CO2:-To Understanding the basics concepts Of CRD
3. CO3:- Understanding the basics concepts of RBD,LSD
4. CO4:- Understanding the basics concepts of BIBD
5. CO5:- Understanding the various techniques to calculate Fcatorial experiment

**MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES
AND PROGRAM SPECIFIC OUTCOMES:**

<i>Course Outcome</i>	Program Outcome							C		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1							H			
CO2		H				H				
CO3				H					H	
CO4								H		
CO5	H						H			H

H = Highly Related; M = Medium; L = Low