

Resolution No.: AC/I(19-20).2.RUA14

S.P. Mandali's
RAMNARAIN RUIA AUTONOMOUS COLLEGE



Syllabus for: S.Y.B.A.

Program: B.A.

Course Code: Statistics (RUASTA)

(Choice Based Credit System (CBCS) with effect from academic year 2018-19)

S.Y.B.A. STATISTICS Syllabus
Credit Based Semester Grading System

Preamble

B. Sc. Statistics program is of 120 credits spread over six semesters. This program is offered at the Department of Statistics, Ramnarain Ruia Autonomous College, Matunga, Mumbai.

The program develops a wide range of skills beyond knowledge of statistical topics, including mathematical, computational and non-mathematical skills.

The program emphasizes on theory and applications of statistics. It is well structured to provide the knowledge and skills in depth necessary for the employability of students in industry, other organizations, as well as in academics.

Ramnarain Ruia Autonomous College has the academic autonomy. The independent projects and presentation work is one of the important components of this program. The syllabus offers two courses in the first year (two semesters) and it covers most of the basic core concepts. The second year syllabus has four courses. The syllabus has been framed to have a good balance of theory, methods and applications of statistics. The third year offers two courses of core statistics and one course of applied statistics in each semester. Practical courses in all three years are designed to enhance the ability of students to study the applications of the core courses and to develop the interpretation skills. The presentations on various topics develop students' public speaking and communication skills.

Objective of Course

In the first year, there will be two courses in Statistics per semester. The following are the objectives of these courses:

1. To understand various data types and to learn visualization techniques.
2. To enable learners to summarize data quantitative and graphical methods.
3. To enable learners with concepts of probability and probability distributions
4. To equip learners with requisite quantitative techniques.
5. To develop learner's presentation and communication skills.

Learning Outcomes

1. Learners will be able to visualize data using elementary graphs and diagrams and will be able to apply appropriate measures for quantitative and qualitative data.
2. Learners will be able to choose and apply an appropriate statistical analysis or modeling methods to solve problems arising in different fields.
3. Learners will be able to use statistical tools to solve problems from different fields.
4. Learners will be able to engage in interpretation of wide range of information from variety of disciplines including quantitative analysis.

SEMESTER III

Title of Course	STATISTICAL METHODS - I			
Course Code	UNIT	TOPICS	Credits	L / Week
RUA301	I	Elementary Probability Theory	2	1
	II	Discrete random variable		1
	III	Some Standard Discrete Distributions		1
Title of Course	OPERATIONS RESEARCH			
RUA302	I	Linear Programming Problem.	2	1
	II	Transportation Problem.		1
	III	Assignment & Sequencing Problem.		1
RUA301	Practical based on courses above		2	6

SEMESTER IV

Title of Course	STATISTICAL METHODS – II			
Course Code	UNIT	TOPICS	Credits	L / Week
RUA401	I	Continuous random variable and Standard Continuous Distribution	2	1
	II	Normal Distribution		1
	III	Elementary topics on Estimation and Testing of hypothesis		1
Title of Course	PROJECT MANAGEMENT AND INDUSTRIAL STATISTICS			
RUS402	I	CPM and PERT.	2	1
	II	Control charts		1
	III	Lot Acceptance Sampling Plans By Attributes.		1
RUA401	Practical based on courses above		2	6

COURSE RUASTA301: STATISTICAL METHODS - I

UNIT – I: Elementary Probability Theory <ul style="list-style-type: none">• Trial, random experiment, sample point and sample space.• Definition of an event, Operation of events, mutually exclusive and exhaustive events.• Classical (Mathematical) and Empirical definitions of Probability and their properties.• Theorems on Addition and Multiplication of probabilities• Independence of events, Pair-wise and Mutual Independence for three events, Conditional probability, Bayes' theorem and its applications	15 Lectures
UNIT – II: Discrete random variable <ul style="list-style-type: none">• Random variable. Definition and properties of probability distribution and cumulative distribution function of discrete random variable.• Raw and Central moments and their relationships.• Concepts of Skewness and Kurtosis and their uses.• Expectation of a random variable. Theorems on Expectation & Variance. Concept of Generating function, Moment Generating function, Cumulant generating function, Probability generating function• Joint probability mass function of two discrete random variables. Independence of two random variables.• Marginal and conditional distributions. Theorems on Expectation & Variance,• Covariance and Coefficient of Correlation.	15 Lectures
UNIT – III: Some Standard Discrete Distributions <ul style="list-style-type: none">• Degenerate (one point) :-Discrete Uniform, Bernoulli, Binomial, Poisson and Hypergeometric distributions derivation of their mean and variance for all the above distributions.• Moment Generating Function and Cumulant Generating Function of Binomial and Poisson distribution.• Recurrence relationship for probabilities of Binomial and Poisson distributions, Poisson approximation to Binomial distribution, Binomial approximation to hypergeometric distribution.	15 Lectures

REFERENCES

- 1 Medhi J.:“Statistical Methods, An Introductory Text”, Second Edition, New Age International Ltd.
- 2 Agarwal B.L.:“Basic Statistics”, New Age International Ltd.
- 3 Spiegel M.R.:“Theory and Problems of Statistics”, Schaum’s Publications series. Tata McGraw-Hill.
- 4 Kothari C.R.:“Research Methodology”, Wiley Eastern Limited.
- 5 David S.:“Elementary Probability”, Cambridge University Press.
- 6 Hoel P.G.:“Introduction to Mathematical Statistics”, Asia Publishing House.
- 7 Hogg R.V. and Tannis E.P.:“Probability and Statistical Inference”. McMillan Publishing Co. Inc.
- 8 PitanJim:“Probability”, Narosa Publishing House.
- 9 Goon A.M., Gupta M.K., Dasgupta B.:“Fundamentals of Statistics”, Volume II: The World Press Private Limited, Calcutta.
10. Gupta S.C., Kapoor V.K.: “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons
11. Gupta S.C., Kapoor V.K.: “Fundamentals of Applied Statistics”, Sultan Chand & Sons

Course Code: RUSSTA302: OPERATIONS RESEARCH

<p>Unit I : Linear Programming Problem (L.P.P.) :</p> <ul style="list-style-type: none"> • Mathematical Formulation: Maximization & Minimization. Concepts of Solution, Feasible Solution, Basic Feasible Solution, Optimal solution. • Graphical Solution for problems with two variables. Simplex method of solving problems with two or more variables. Big M method. • Concept of Duality. Its use in solving L.P.P. Relationship between optimum solutions to Primal and Dual. Economic interpretation of Dual. 	<p>15 Lectures</p>
<p>Unit II : Transportation Problem:</p> <ul style="list-style-type: none"> • Concept, Mathematical Formulation. Concepts of Solution, Feasible Solution. Initial Basic Feasible Solution by North-West Corner Rule, Matrix Minima Method, Vogel’s Approximation Method. Optimal Solution by MODI Method. Optimality test, Improvement procedure. • Variants in Transportation Problem: Unbalanced, Maximization type, Restricted allocations. 	<p>15 Lectures</p>
<p>Unit III :Assignment Problem:</p> <ul style="list-style-type: none"> • Concept. Mathematical Formulation • Solution by: Complete Enumeration Method and Hungarian method. • Variants in Assignment Problem: Unbalanced, Maximization type. • Airline Operating Problem • Travelling Salesman Problem <p>Sequencing :</p> <ul style="list-style-type: none"> • Processing n Jobs through 2 and 3 Machines , 2 Jobs through m Machines and n jobs through m machines 	<p>15 Lectures</p>

REFERENCES:

1. Kantiswaroop and Manmohan Gupta. 4th Edition; S Chand & Sons: Operations Research
2. Richard Broson. 2nd edition Tata Mcgraw Hill Publishing Company Ltd.: Schaum Series book in O.R.
3. Methods and Problems: Maurice Sasieni, Arthur Yaspan and Lawrence Friedman, (1959), John Wiley & Sons.: Operations Research
4. J K Sharma, (1989), Tata McGraw Hill Publishing Company Ltd.: Mathematical Models in Operations Research
5. Harvey M. Wagner, 2nd Edition, Prentice Hall of India Ltd.: Principles of Operations Research with Applications to Management Decisions
6. S.D.Sharma.11th edition, Kedar Nath Ram Nath & Company.: Operations Research
7. H. A.Taha.6th edition, Prentice Hall of India.: Operations Research
8. J.K.Sharma, (2001), MacMillan India Ltd.: Quantitative Techniques For Managerial Decisions

COURSE RUASTA401: STATISTICAL METHODS – II

<p>UNIT – I: Continuous random variable and some Standard Continuous Distributions</p> <ul style="list-style-type: none"> • Concept of Continuous random variable and properties of its probability distribution • Probability density function and cumulative distribution function. • Their graphical representation. • Expectation of a random variable and its properties. Concept of M.G.F. and C.G.F. characteristics. Measures of location, dispersion, skewness and kurtosis. • Raw and central moments (simple illustrations). • Uniform, Exponential distribution (location and scale parameter), memory less property of exponential distribution, • Derivations of mean, median, variance, MG.F. and C.G.F. for Uniform and Exponential distributions. 	<p>15 Lectures</p>
<p>UNIT – II: Normal Distribution and Sampling Distribution</p> <ul style="list-style-type: none"> • Normal distribution • Properties of Normal distribution/curve (without proof). Use of normal tables. • Normal approximation to Binomial and Poisson distribution (statement only) • Sample from a distribution: Concept of a statistic, estimate and its sampling distribution. Parameter, its estimator and bias, unbiasedness, standard error of an estimator. • Concept of Central Limit theorem (statement only) • Sampling distribution of sample mean and sample proportion difference between two population means and two proportions. • Standard errors of sample mean and sample proportion. 	<p>15 Lectures</p>
<p>UNIT – VI: Basics of Theory of Estimation and Testing of hypothesis</p> <ul style="list-style-type: none"> • Point and Interval estimate of single mean, single proportion from sample of large size. • Statistical tests: Concept of hypothesis, Null and Alternative Hypothesis, Types of Errors, Critical region, Level of significance, Power • Large sample tests <ul style="list-style-type: none"> For testing specified value of population mean For testing specified value in difference of two means For testing specified value of population proportion For testing specified value of difference of population proportion • Concept of p-value 	<p>15 Lectures</p>

REFERENCES

- 1 Medhi J.:“Statistical Methods, An Introductory Text”, Second Edition, New Age International Ltd.
- 2 Agarwal B.L.:“Basic Statistics”, New Age International Ltd.
- 3 Spiegel M.R.:“Theory and Problems of Statistics”, Schaum’s Publications series. Tata McGraw-Hill.
- 4 Kothari C.R.:“Research Methodology”, Wiley Eastern Limited.
- 5 David S.:“Elementary Probability”, Cambridge University Press.
- 6 Hoel P.G.:“Introduction to Mathematical Statistics”, Asia Publishing House.
- 7 Hogg R.V. and Tannis E.P.:“Probability and Statistical Inference”. McMillan Publishing Co. Inc.
- 8 PitanJim:“Probability”, Narosa Publishing House.
- 9 Goon A.M., Gupta M.K., Dasgupta B.:“Fundamentals of Statistics”, Volume II: The World Press Private Limited, Calcutta.
10. Gupta S.C., Kapoor V.K.: “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons
11. Gupta S.C., Kapoor V.K.: “Fundamentals of Applied Statistics”, Sultan Chand & Sons

**Course Code RUASTA402: PROJECT MANAGEMENT AND INDUSTRIAL
STATISTICS**

<p>Unit I : CPM and PERT:</p> <ul style="list-style-type: none"> • Objective and Outline of the techniques. Diagrammatic representation of activities in a project: Gantt Chart and Network Diagram. • Slack time and Float times. Determination of Critical path. Probability consideration in project scheduling. • Project cost analysis. • Updating. 	<p>15 Lectures</p>
<p>Unit II : Statistical Quality Control-I:</p> <ul style="list-style-type: none"> • Principles of control. Process quality control of variables. \bar{X} bar and R, \bar{X}bar and Sigma Chart and their uses. Problems involving setting up standards for future use. • Exponentially weighted moving average (EWMA) control charts, Cumulative Sum (CUSUM) control chart, Introduction to Six sigma limits. • Concept of Natural Tolerance Limits, Specification Limits and Detection of shift 	<p>15 Lectures</p>
<p>Unit III : Statistical Quality Control-II:</p> <ul style="list-style-type: none"> • Principles of control. Process quality control of attributes p, c, np charts and their uses. p-chart and C-chart with variable sample size. Problems involving setting up standards for future use • Acceptance sampling plan • Single Sampling Plans (without curtailment). • OC function and OC curves. AQL, LTPD, ASN, ATI, AOQ, Consumer's risk, Producer's risk. • Double Sampling Plan (Concept only) 	<p>15 Lectures</p>

REFERENCES:

1. E.L. Grant. (2nd edition) McGraw Hill, 1988.: Statistical Quality Control
2. Duncan. (3rd edition) D. Taraporewala sons & company.: Quality Control and Industrial Statistics
3. Bertrand L. Hansen, (1973), Prentice Hall of India Pvt. Ltd.: Quality Control: Theory and Applications
4. Douglas Montgomery, Arizona State University. John Wiley & Sons, Inc. (6th Edition): Statistical Quality Control
5. Gupta S.C., Kapoor V.K., Fundamentals of Applied Statistics, Sultan Chand & Sons
6. Srinath. 2nd edition, East-west press Pvt. Ltd.: PERT and CPM, Principles and Applications
7. Kantiswaroop and Manmohan Gupta. 4th Edition; S Chand & Sons.: Operations Research
8. Richard Broson. 2nd edition Tata McGraw Hill Publishing Company Ltd.: Schaum Series book in O.R.
9. Maurice Sasieni, Arthur Yaspan and Lawrence Friedman, (1959), John Wiley & Sons.: Operations Research: Methods and Problems
10. J K Sharma, (1989), Tata McGraw Hill Publishing Company Ltd.: Mathematical Models in Operations Research
11. S.D.Sharma. 11th edition, Kedar Nath Ram Nath & Company.: Operations Research
12. H. A. Taha, 6th edition, Prentice Hall of India.: Operations Research
13. J.K.Sharma, (2001), MacMillan India Ltd.: Quantitative Techniques for Managerial Decisions

Distribution of topics for Practicals in Semester I

Course Code RUASTAP301(A)		Course Code RUASTAP301(B)	
Sr. No.	Practicals based on course RUASTA301	Sr. No.	Practicals based on course RUASTA302
1	Probability	1	Formulation and Graphical Solution of L.P.P.
2	Discrete Random Variables	2	Simplex Method.
3	Bivariate Probability Distributions	3	Duality.
4	Binomial Distribution	4	Transportation.
5	Poisson Distribution	5	Assignment.
6	Hypergeometric Distribution	6	Sequencing.
7	Practical using Excel and R i) Binomial distribution ii) Poisson distribution iii) Hypergeometric distribution	7	Problems solving using TORA.

Distribution of topics for Practicals in Semester II

Course Code RUASTAP401(A)		Course Code RUASTAP401(B)	
Sr. No.	Practicals based on course RUASTA401	Sr. No.	Practicals based on course RUASTA402
1	Continuous Random Variables	1	PERT
2	Uniform and Exponential Distributions	2	CPM
3	Normal Distribution	3	Project cost analysis
4	Sampling Distribution	4	Updating
5	Testing of Hypothesis	5	Control Charts for attributes
6	Large sample Tests	6	Control Charts for variables
7	Practical using Excel and R i)Uniform and Exponential ii)Normal Distribution iii) Sampling Distribution iv) Testing of Hypotheses v) Large sample Tests	7	Acceptance Sampling Plans.
			Practical using EXCEL and TORA software

THEORY

Internal Assessment of Theory Core Courses Per Semester Per Course

1. One Class Test/ Project / Assignment / Presentation20 Marks.
2. One Class Test / Project / Assignment / Presentation20 Marks.

Semester End Examination

Theory: At the end of the semester, examination of two hours duration and 60 marks based on the three units shall be held for each course.

Pattern of **Theory question** paper at the end of the semester for **each course:**

There shall be **THREE COMPULSORY** Questions of 20 marks each (Internal Option).

Question1 based on Unit I, Question 2 based on Unit II, Question 3 based on Unit III.

PRACTICAL

Internal Assessment of Practical Core Courses per Semester per course

1. One Class Test15 Marks.
2. Journal05 Marks.

Practical Core Courses per Semester per course

1. Practical Examination30 Marks.

At the end of the semester, examination of one and half hours duration and 30 marks shall be held for **each course**.

Pattern of **Practical question** paper at the end of the semester for **each theory course:**

There shall be **Three COMPULSORY** Questions with internal choice.

Workload

Theory: 3 lectures per week per course.

Practicals: 3 lecture periods per course per week per batch. All three lecture periods of the practicals shall be conducted in succession together on a single day.
