

PREAMBLE

Though God does not play dice, every incident in our life and civilization that is not yet history is unknown. Statistics is a body of numerical methods for making wise decisions in the face of uncertainty. It is the science of developing and studying methods for collecting, analyzing, interpreting and presenting empirical data.

H. G. Wells, the prolific English writer and father of Science Fiction genre who died in 1946 prophecies that "Statistical thinking will one day be as necessary a qualification for efficient citizenship as the ability to read and write."

Statistics is a highly interdisciplinary field that finds applicability in not only all scientific research but also business activities like demand forecasting, consumer behavior, banking, finance and insurance, medicine and health. It is an extremely important subject in the study of Economics and hence has significant impact on politics and government.

Today's cutting-edge computer technologies like Big Data, Artificial Intelligence, Machine Learning etc. use statistics as base. Therefore, the employment opportunities for statisticians are vast. Fortune magazine ranked statistics and biostatistics among the top graduate degrees based on salary, growth and job satisfaction. It is one of the best jobs for women.

The Department of Mathematics and Statistics offers students basic courses in Statistics along with separate courses in Computer Systems & Software....

In the period of three years of degree programme, the Department offers various courses in the sub-disciplines of Statistics like Basic Statistical measures, Probability and probability distributions, Operations Research, Applied Statistics etc. Acquainting the students with these will help them in developing analytical skills but also in appearing various competitive examinations.

Eligibility: A student must have successfully cleared the HSC (12th) examination

Preferable: Liking for mathematics and possess analytical ability

Programme Duration: Three years (Entire B.A. Course)

Mode of Delivery: Offline (Online, in case of emergency)

557

Paper No	Paper Name	Semester	Course Nomenclature	Course Code	Credits
Ш	Operations Research and Industrial		Nomenciature OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS -I PRACTICALS Based on JBCUASTA302	JBCUASTA302 JBCUASTP302	2
	Statistics		OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS -II PRACTICALS Based on	JBCUASTA402 JBCUASTP402	2
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	*	ST	D. 196 ⁹	*	1

DISTRIBUTION OF TOPICS AND CREDITS

(Credit Based Semester and Grading System with effect

from the academic year2022–2023)

Programme Specific Outcomes: Statistics-JBCUASTATS

PROGRAMME-SPECIFICOUTCOMES

PSO	PSO Description
PSO1	Students learn to design data collection plans and basic tools of descriptive statistics.
PSO2	Understand, organize, manage and present the data generated in various scenarios of scientific, industrial, or social problems.
PSO3	Perform statistical inference in several circumstances and interpret the results in an applied context
PSO4	Students will be able to learn Project management techniques, transportation and assignment techniques. Concepts will be developed regarding techniques used in industries and Applications of LPP
PSO5	Concept of probability modeling will be developed by studying discrete and continuous probability distributions.
PSO6	Students will be able to know appropriate sampling method with respect to the objective and nature of study and data.
PSO7	Students will be able to understand the Applications of Statistics in Demography and Acturial Science
PSO8	To equip the learners with technical skills which prepare them to become competitive and help them to enter into a promising professional life after graduation.

Semester III

Course Nomenclature: Operations Research and Industrial Statistics -I

Course Code: JBCUASTA302

COURSE OUTCOMES

- 1. Imparting knowledge to learners to understand the concepts and tools of Operations Research as management in multidisciplinary functional area in a company.
- 2. To make them understand how to solve the problems of operations research using different solution algorithm.
- 3. To apply the techniques of operations research to make effective business decisions using mathematical models.
- 4. Skills using scientific method technique to arrive at optimum solutions to the problems of transportation and assignment and sequencing of jobs.

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SYLLABUS

<u>SYBA</u>

STATISTICS PAPER III

SEMESTER III

OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS - I

COURSE CODE:	TITLE	Credits: 2
JBCUASTA302	GUILES SOL	No. of
	COLLEGE VAN	lectures:-(45)
Unit I	Linear Programming Problem: (L.P.P)	15
	Definition	
	Mathematical Formulation: Maximization and Minimization	
	Concepts of Solution, Feasible Solution, Basic Feasible Solution,	5
	Optimal Solution, Slack, Surplus and Artificial variable.	
	Standard form, Canonical form	S /
	Graphical Method& Simplex Algorithm to obtain the solution to	*
	an L.P.P.	
	Problems involving Unique Solution, Multiple Solution,	
	Unbounded Solution and Infeasible Solution.	
	Big M method.	
	Concept of Duality & its economic interpretation	
	स्थापना • नौपाडा ठाणे • १९३५	
Unit II	Transportation Problem:	15
	Definition	77
	Mathematical Formulation Concepts of solution Feasible	
	Solution Basic feasible solution Optimal and multiple solutions	
	Initial Basic Feasible Solution using: -	
	i) North - West Corper rule	
	ii) Matrix Minima Method	
	ii) Vogel's Approximation Method (VAM)	
	MODI Method for ontimality	
	WODI Weukou for optimility.	
	Problems involving unique solution, multiple solutions.	
	degeneracy, maximization, prohibited route(s) and production	
	costs.	
	Unbalanced Transportation problem	
	Cheminer Humpermion processi	

Unit III	Assignment Problem:	15
	Definition	
	Mathematical formulation. Solution by Hungarian Method.	
	Unbalanced Assignment problems.	
	Problems involving Maximization & prohibited assignments.	
	Travelling salesman problem.	
	Sequencing:	R
	Processing n jobs through 2 and 3 Machines and 2 jobs through	
	mMachines.	

Practical: Course Code: JBCUASTP302

COURSE CODE:	TITLE	Credit: 1
JBCUASTP302	रहती ज्ञानसरः	No. of Lectures Per week:3
Unit I	Linear Programming Problem: (L.P.P)	2
*	1) Mathematical Formulation of L.P.P.	×
	(Maximization and Minimization),	
	2) Solution to L.P.P by Graphical Method.	
	3) Solution to L.P.P by Simplex Method.	
Unit II	Transportation Problem:	~
	1) Initial Basic Feasible Solution using: -	
	2	
	i) North - West Corner rule.	
	ii) Matrix Minima Method.	
	iii) Vogel's Approximation Method (VAM)	
	2) MODI Method for optimality.	
	3) Miscellaneous Problems involving unique solution,	
	multiple solutions, degeneracy, maximization, prohibited	
	route(s) and production costs. Unbalanced Transportation	
	problem.	
Unit III	Assignment Problem and Sequencing:	
	1) Solution by Hungarian Method. Assignment problems.	
	2) Sequencing: Processing n jobs through 2 and 3 Machines	
	1 rocessing in jous unough 2 and 3 machines.	

Semester IV

Course Nomenclature: OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS - II

Course Code: JBCUASTA402

Course Outcome

- 1. To introduce learners to apply the optimizing techniques of Operations Research.
- 2. To understand how to plan, schedule and control project activities through CPM and PERT techniques in Operations Research.
- 3. To understand the basic aspects involved in any quality control programme.
- 4. Construct various control charts for variables and attributes to obtain standard values for future use.
- 5. To propose the best strategy using decision making methods under uncertainty in Decision theory.

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SYLLABUS <u>SYBA</u> STATISTICS PAPER III

SEMESTER IV

OPERATIONS RESEARCH AND INDUSTRIAL STATISTICS – II

COURSE CODE:	TITLE	Credits: 2
JBCUASTA402		No. of
		lectures:-(45)
Unit I	CPM and PERT:	15
	Concept of project as an organized effort with time management.	
	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.	\mathcal{D}
	Project cost analysis.	
+	Updating.	*
Unit II	Statistical Quality Control:	15
	Principles of control, Basis of statistical quality control (chance causes	
	and assignable causes), benefits of SQC, Process control and Product	
	control विद्या प्रसारक मंडळ 🖊 🛩	
	Control limits, Specification limits and Tolerance limits	
	Control charts for variables X bar chart and R chart and their	
	applications. Problems involving setting up standards for future use.	
	Control chart for attributes - control chart for fraction defective (p	
	chart) and control chart for number of defects per unit (C chart) and its	
	applications. Problems involving setting up standards for future use.	
	XmR - chart :control charts for processes - Introduction	
Unit III	DECISION THEORY :	15
	Decision making under uncertainty: Laplace criterion, Maximax	
	(Minimin) criterion, Maximin (Minimax) criterion, Hurwitz α criterion,	
	Minimax Regret criterion,	
	Decision making under risk: Expected Monetary Value criterion,	
	Expected Opportunity Loss criterion EPPI, EVPI.	
	Decision tree analysis.	

PRACTICAL Course Code: JBCUASTP402

COURSE CODE:	TITLE	Credit 1
JBCUASTP402		No. of
		lectures
		Per week :3
Unit I	CPM and PERT:	
	1) Network Diagram. Determination of Critical path.	
	2) Slack time and Float times	
	3) PERT. COLLEG	U
Unit II	Statistical Quality Control :	
	1) Control Charts for Attributes	
	2) Control Charts for Variables	
· ·		\circ
Unit III	DECISION THEORY :	
	1) Decision making under uncertainty Laplace criterion	
	Maximax (Minimin) criterion, Maximin (Minimax)	(P) \
	criterion, Hurwitz a criterion, Minimax Regret	
1 + 9	criterion,	
	2) Decision making under risk: Expected Monetary	
	Value criterion, Expected Opportunity Loss criterion	
	EPPI, EVPL	7
	3) Decision tree analysis	
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	रभागन क्रमेपाल सामे ७ १९३८	

REFERENCES

- 1. Operations Research by Dr. S.D. Sharma .Kedar Nath Ram Nath & company.
- 2. Mathematical models in Operations research by J. K. Sharma Tata McGraw Hill Publishing Comp .Ltd
- 3. Textbook of Operations Research by K Nagarajan .New Age International Publishers.
- 4. Operations Research by Kantiswarup ,P.K. Gupta , Manmohan Sultan Chand & sons.
- 5. Operations Research by H.A Taha Prentice Hall of India.
- 6. Quantitative Techniques in Management by N.D Vora Tata McGraw Hill Publishing Comp .Ltd
- 7. PERT and CPM Principles and Applications by Srinath East West press Pvt Ltd.

Modality of Assessment

Serial No.	Evaluation Type	Marks]
1	Written Test	20]
2	Assignment/Project/presentations	15	
3	Class Participation	05	2
	Total:	40	P

A. Internal Assessment: 40% - 40 Marks

B. External Examination: 60%- 60 Marks

Semester End Theory Examination

11

Time: 2 hours

- NB. 1. All questions are compulsory.
 - 2. Each question has internal options.
 - 3. Figures to the right indicate marks.

0.1		Attount one These out of 5	15
Q.1		Attempt any Three out of 5	15
	(a)	Unit1	
	(b)		
	(c)		
	(d)	Unit1	
	(e)	Unit1	
Q.2		Attempt any Three out of 5	15
	(a)	Unit2	
	(b)	Unit2	
	(c)	Unit2	
	(d)	Unit2	
	(e)	Unit2	
Q.3		Attempt any Three out of 5	15
	(a)	Unit3	
	(b)	Unit3	
	(c)	Unit3	
	(d)	Unit3	
	(e)	Unit3	

Q.4		Attempt any Three out of 5 (Concept based)	15
	(a)	All units	
	(b)	All units	
	(c)	All units	
	(d)	All units	
	(e)	All units	

Modality of Assessment (For Practical)

A. Internal Assessment : 40% - 20 Marks			
Particulars	Marks		
Journal	5		
Assignments/ SQC project	15		
Total	20		

B. External Examination: 60%-30 Marks

Semester End Practical Examination

Time: $1\frac{1}{2}$ hours

- NB. 1. All questions are compulsory.
 - 2. Each question has internal options.
 - 3. Figures to the right indicate marks.

Q.1		Attempt any Onegr प्रसारक मंडळ	10
	(a)	Unit1 स्थापना • नौपाडा ठाणे • १९३५	
	(b)	Unit 1	
Q.2		Attempt any Three out of 5	10
	(a)	Unit2	
	(b)	Unit2	
		C.C.T. 1069	
Q.3		Attempt any Three out of 5	10
	(a)	Unit3	
	(b)	Unit3	
	•	Total :	30

Workload:

Theory: 3 lectures per week per course.

Practicals : 3 lecture periods per course per week per batch.