



GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

Estd: 1853; An Autonomous Institution & Accredited by NAAC at Grade 'A+'

East Godavari District -533 105, Andhra Pradesh, India

(Affiliated to Adikavi Nannayya University, Rajamahendravaram, A.P -533296)

www.gcrjy.ac.in



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PRINCIPAL

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BOARD OF STUDIES

2025-2026



DEPARTMENT OF STATISTICS

BOARD OF STUDIES (B.O.S)

SEMESTER -1,2,3,4,5,6

SYLLABUS

MODEL PAPERS & QUESTION BANKS

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BOARD OF STUDIES 2025-26

MEETING NOTICE

A meeting of Board of Studies of the Department of Statistics, GOVERNMENT COLLEGE (A), RAJAHMUNDRY will be held on 15-09-2025 at 10:00 AM in the department of Statistics, Government Degree College(A),RAJAHMUNDRY to consider the following Agenda.

Agenda:

Consideration, Ratification and approval of the following for the Academic Year 2025–26

- 1) Curriculum Design for all the semesters.
- 2) Design of Course Outcomes and Course Objectives.
- 3) Identifying / inclusions of components of Skill Development, Employability and Entrepreneurship in the curriculum.
- 4) Additional inputs into the curriculum.
- 5) Designing Model Question Papers and identifying potential paper setters.
- 6) Innovative Teaching-Learning Methodology (Learner Centric)
- 7) Academic activities of the Department.
- 8) Any other proposal with the permission of the chair

Minutes & Resolutions of BOS dated 15-09-2025

A meeting was conducted for Board of Studies on 15-09-2025 from 10.00 AM for all the semesters for the UG programmes B.Sc(Honours) Statistics under the chairmanship of DrN.Madhavi (Lecturer-in-charge, Dept of Statistics) with the committee members through offline/online mode. The syllabus was discussed for each paper of semesters I,II & III (as per APCHE guidelines) for the admitted batch 2025-2026 and ratified internships as per 2023-2024. Regulations finalized after suggesting suitable modifications as demands by the trends in the industry and advances in the technology.

The following proposals were submitted for the consideration and approval of the honorable members of the meeting as a part of the agenda.

Agenda Point 1: Program wise Curriculum design for all the semesters

Discussion :

- A discussion was being held among the members regarding the curriculum design for all the semesters of first , second and third years for the programmes B.Sc (Honours)

Resolutions:

1. It is resolved by all the members of Board of Studies to start B.Sc(Honours) Statistics Programme from this academic year 2025-2026 onwards and the Curriculum design for this programme is approved.
2. It is resolved to teach Skill Paper Artificial Intelligence (AI) Fundamentals by the department for first semester B.Sc (Honours) Statistics Students and 2 hrs per week is allotted for Teaching.
3. It is resolved to offer two papers “Descriptive Statistics” and “Random variables and Mathematical Expectations” in Semester I with 5 hrs per week with 5 credits each
4. It is resolved to offer minor paper “Descriptive Statistics” for B.Sc(Honours) Statistics from this academic year in Semester I and this is offered for all Arts, Commerce and Biology Students with 5 hrs per week theory-3 + practical-2) and 5 credits (theory-3 + practical-2)
5. It is resolved to study Language Papers English, Telugu/Sanskrit/Hindi in Semesters I and II in first and Second Years
6. It is ratified and approved by the members regarding the syllabus for the second and third year semesters wish and is shown below.
7. It is resolved to send the students for Community service project at the end of second semester. Mentors were allotted for the batch of students and the project is to be completed within 8 weeks and 100 marks were allotted for this project. Any student who have not undergone the CSP project will be failed.
8. It is resolved to send the students for internship/Apprenticeship for about two months and four months internship/ Apprenticeship in fifth or sixth semester.
9. It is also resolved to send the students for internship in fifth semester and some students in sixth semester

10. It is resolved to adopt the prescribed syllabus shown for all semesters for all courses
It is resolved to design the curriculum in such a way that the students must select one elective out of three elective for B.sc Statistics for fifth semester/sixth semester and accordingly Curricular and Co-Curricular activities were to be followed

11. It is resolved to take up study projects using SPSS Software and R-Programming which is very Important

12. The assessment component is designed as follows:

For I ,II and III year students theory examinations: 100 Marks
External Exam: 50Marks
Internal Exam: 50Marks

The internal exam is based on 30 marks for internal exams (20 for first internal tests and 10 for second internal online exam)

The remaining 20 marks are allotted as follows
5 marks for assignment
5 marks for viva/Projects/Study tours
5 marks for seminars/surveys/case studies
5 marks for attendance

Practical Examinations would be conducted at the end of the each semesters for B.Sc(H) three year students and there will be internal evaluation at the end of 1,3,5semesters and external evaluation at the end of 2, 4, 6 semesters for each year.

Practical internal exam will be conducted for all semesters for 50 marks

Community service project is undertaken in second semester for 100 marks

100 marks were allotted as follows

(i) Project Log Book	-----	20 Marks
(ii) Project Implementation	-----	30 Marks
(iii) Project Report Writing	-----	25 Marks
(iv) Project Viva	-----	25 Marks

Marks were allotted for Short term internship in fourth semester and Long-term internship in fifth/sixth semester and internal viva is conducted by college faculty for 100 marks.

(i) For Short term internship 100 marks were allotted
(ii) For Long term internship 200 marks were allotted

Agenda Point 2: Designing of Course Outcomes and Course Objectives:

Discussion:

The members thoroughly verified the prepared programme outcomes, course outcomes and course objectives for all the programmes and courses and satisfied.

Resolutions

13. It is resolved to incorporate the programme outcomes, course outcomes and course objectives for all the programmes and courses in an efficient manner.

14. It is resolved to incorporate CO PO mapping for all the programmes and courses and to be given in the Syllabus

Agenda Point 3: Identification of unit wise assignment questions and relevant model question paper

Discussion:

The members pointed out some important questions for assignment purpose keeping in view of examinations and compulsory questions and model question papers were verified

Resolutions

15. It is resolved to give assignment questions as suggested by the members

16. It is resolved to prepare relevant model question papers for the syllabus framed.

Agenda Point 4: Identifying inclusion of components of Skill Development, Employability and Entrepreneurship in the course content and specific activity proposed

Discussion:

Discussion is being held by all the members regarding Skill development, Employability and Entrepreneurship components.

Resolutions:

17. Basing on the discussion held, it is resolved to identify skill, employability and Entrepreneurship Components by specifying with red, green and Yellow colors .

18. It is resolved to specify the activity proposed for skill development, Employability and Entrepreneurship in the course content and to be shown in the syllabus

Agenda Point 5: Additional inputs into the curriculum:

Discussion:

Sri N.Srinivasa Rao (University Nominee) discussed about the additional inputs into the curriculum wherever necessary to give clear understanding about the topic and these are not included for exam.

19. It is resolved to incorporate additional inputs into the curriculum wherever it is necessary and is given below in the table

MAJOR PAPERS

S.N	Name of the Course	Course Code	Total No of Topics (in all units)	No of Topics Added/ Replaced	% of Content Added/ Replaced
SEMESTER - 1					
1	M1: Descriptive Statistics	225914	5	5	100%
2	M2: Random Variable And Mathematical Expectations	225915	5	5	100%
SEMESTER - 2					
3	M1: Theoretical Discrete Distribution	225901	5	5	100%
4	M2: Theoretical Continuous Distribution	225902	5	5	100%
SEMESTER - 3					
5	M1: Theoretical Discrete Distribution	225903	5	5	100%
6	M2: Theoretical Continuous Distribution	225904	5	5	100%
7	M3: Statistical Methods	225905	5	5	100%
8	M4: Statistical Inference	225906	5	5	100%

SEMESTER – 4

9	M1: Theory Of Sampling	225907	5	5	100%
10	M2: Design Of Experiments	225908	5	5	100%
11	M3: Numerical Analysis	225909	5	5	100%

SEMESTER – 5 (OR) SEMESTER – 6

12	M1: Applied Statistics	225910	5	5	100%
13	M2: Computational Techniques And R Programming	225911	5	5	100%
14	M3: Operation Research	225912	5	5	100%
15	M4: Optimization Techniques	225913	5	5	100%

MINOR PAPERS

S.N	Name of the Course	Course Code	Total No of Topics (in all units)	No of Topics Added/ Replaced	% of Content Added/ Replaced
SEMESTER – 3					
1	MN: Statistical Methods		5	5	100%
SEMESTER – 4					
2	MN: Theory Of Sampling		5	5	100%
3	MN: Design Of Experiments		5	5	100%
SEMESTER – 5 (OR) SEMESTER – 6					
4	MN: Applied Statistics		5	5	100%
5	MN: Computational Techniques And R Programming		5	5	100%

Agenda Point 6: Designing Model question Papers and identifying potential paper Setters**Discussion:**

The members saw the designed model question papers for all the courses and identified the paper setters from various colleges.

Resolutions:

20. It is resolved to prepare model question papers for both programmes B.Sc and B.A and the model for all the courses are to be maintained in same manner

21. It is resolved to identify efficient paper setters from various colleges and the list of the paper setters is given in the syllabus.

Agenda Point 7: Innovative Teaching—Learning Methodology (Learner Centric)**Discussion:**

The various methods of Teaching Learning were discussed by all the members. ICT teaching methodology and Blended mode teaching is given more importance by all the members. Online teaching methodology is also preferred and essential way of teaching learning in the present scenario. Google classroom methodology is also preferred in making the students online tests.

22. It is resolved by all members to follow latest methodologies and easy way of Teaching Learning in maintaining the students Standards.

23. It is resolved to follow blended mode of teaching besides the lecture method, ICT based method etc.

Agenda Point 8: Academic activities of the Department such as Seminars, fieldworks etc.

Discussion:

The department conducts National Statistics day, World population day every year and conducts guest lectures, competitions like elocution, Essay writing, quiz etc . Apart from this the department conducts seminars, webinars, extension lectures, fieldworks etc. Chart Exhibition is also celebrated and outside school students were invited to see the chart exhibition and all these activities are put before the members to ratify.

24. It is resolved to conduct department activities, seminars, webinars, guest lectures, field works etc for the Students

25. It is resolved to conduct chart exhibition to increase the knowledge among the students by way of showing the information in the form of charts.

Agenda Point 9: Any other proposal with the permission of the chair

Discussion:

A Certificate course is being handled by the department at the end of fourth semester and the title is “Statistical Tools for Research Methodology”

26. It is resolved to run the certificate course this year also

27. It is resolved to conduct an exam in the certificate course for 50 marks.

Signatures of the members Present

- 1.
- 2.
- 3.
- 4.

Chairman
Board of Studies

Committee Constituted for Board of Studies Meeting for the year 2025-2026

S.No.	Name	Member	Signature
1	Dr.N. Madhavi Head, Lecturer in Statistics Dept of Statistics Govt College(A), Rajahmundry	Chairman	
2	Sri N.Srinivasa Rao Lecturer in Statistics Andhra Loyola College, Vijayawada	University Nominee	
3	Prof. B.Muniswamy Head, Dept of Statistics & Director, Population Research Centre Andhra University, Visakhapatnam	Subject Expert	
4	Sri K.Ashok Lecturer in Statistics, SRR & CVR Government Degree College (A), Vijayawada	Subject Expert	
5.	Sri B.Suneel Kumar Senior Technical Head, Software Development, Datapro, Rajahmundry	Expert from Corporate Sector	
6.	Mr.D.Dhanunjaya Rao Research scholar, Dept of statistics Central university, Bihar	Alumnus	
7.	Mr.J.NagaSriram Guest faculty in Statistics Govt college(A),Rajahmundry	Member	
8.	Ms.K.Suneetha Guest faculty in Statistics Govt College(A),Rajahmundry	Member	
9.	Student Members 1. Sh.Reshma ,IIBsc Stat(H) 2. M.Mahesh , IIBsc Stat(H)	Students	
10.	3. S.Sushma , IIBsc Stat(H) 4. B.Lokesh , IIBsc Stat(H)	Students	

Signatures

- 1.
- 2.
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- 4.

Chairman
Board of Studies

Nomination of Members for Board of Studies

ACADEMIC CELL, GOVERNMENT
COLLEGE(AUTONOMOUS)RAJAHMUNDI

ProceedingsofthePrincipal, GovernmentCollege(Autonomous), Rajahmundry
Present:Dr. Ramachandra R.K, M.Sc., Ph.D.
Rc. No.37/GCRJY/UG-BoS/2025-26dt.04.09.2025

Sub: GovernmentCollege(A), Rajamahendravaram-UGBoardsofStudies (BoS)- Nomination of Members – Orders issued.

Ref:1.UGCGuidelinesofforAutonomousColleges-2023.

2.Proc.No.ANUR/DAA/2025,dated30-08-2025oftheVice-Chancellor,ANUR

Order

The Principal, Government College (Autonomous) Rajahmundry is pleased to nominate the following members to UG Board of Studies to frame the syllabus of **Statistics subject** in all the semesters duly following the norms of the UGC regulations for the Autonomous colleges 2023.

S.No	Name	Designation
1	Dr.N.Madhavi	Chairman
2	All Faculty members in the department	Member
3	Prof.B.Muniswamy, HoD, Department of Statistics, Andhra University	Subject Expert
4	SriK.Ashok, Lecturer in Statistics, SRR&CVR Government Degree College(A), Vijayawada	Subject Expert
5	Sri N.Srinivasa Rao, Andhra Loyola College, Vijayawada	University Nominee
6	Sri B.Suneel Kumar, Senior Technical Head, Software Development, Datapro, Rajahmundry	Expert from Corporate Sector
7	Mr.D.Dhanunjaya Rao, Research scholar, Dept of statistics, Central university, Bihar	Alumnus

TheabovemembersarerequestedtoattendtheBoSmeetinginSeptember2025 and share their valuable views, and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stakeholders and National requirement for consideration and approval of the IQAC and Academic Council
- Suggest methodologies for innovative teaching and evaluation techniques
- Suggest the panel of names to the Academic Council for appointment of Examiners
- Coordinate research, teaching, extension and other activities in the department of the College.
- Suggest CLO, PLO, PI and subject experts to develop question bank in compliance with Bloom's Taxonomy.

The above said members are requested to bestow their services for the successful organization of the event.


PRINCIPAL
GOVERNMENT COLLEGE(AUTONOMOUS)
RAJAHMUNDY

Government College(Autonomous), near 'Y' junction, RAJAMAHENDRAVARAM-

Approved List of Examiners/ Paper Setters

Name of the Lecturer/Reader	College	Phone.NO	Mail.id
Sri A. Anand, Lecturer	M.R.College, Vizianagaram		
Dr.C.S.S.R.L.H.Rao, Lecturer	M.R.College, Vizianagaram	9394066306	chraomr@gmail.com
Dr, P. KondaBabu, Lecturer	M.R.College, Vizianagaram	9491571046	kondababupuli@gmail.com
Sri G. S Moses, Lecturer	D.N R College, Bhimavaram	9440185103	
Sri N. Srinivasa Rao, Lecturer	AndhraLoyolaCollege, Vijayawada		nunnasr@gmail.com
Dr. V. RohiniKumari, Lecturer	Govt. College for Men, Ananthapur	9848236535	vrohiniikumari@gmail.com
Dr.KousarJahaBegum,Lecturer	Govt. College, Chittoor	9985312244	begum.kousar123@gmail.com
Sri T. Gandhi, Lecturer	Mrs.A.V.N.College,Visakhapatnam		
Sri V. Praveen, Lecturer	A.B.N. College, Kovvur	8184853368	
Grandhi Prasad, Lecturer	Adityadegreecollege,Rajahmundry		
Dr.D.V.RamanaMurthy,Lecture	Skvt College, Rajahmundry	9949135864	dr.dvvmurthy@gmail.com
Sri K. Ashok, Lecturer	SRR&CVR College(A), Vijayawada	9848505506	sairamya285@gmail.com
Dr.B.ChndraSekharReddy ,Lecturer	S R DegreeCollege, Punganur	9492376446	csr.bhumireddy@gmail.com
Dr.B.Venkata Ram, Lecturer	SSBN Degree College,Ananthapur	9440410474	gsd.atp@gmail.com
Dr. V.Munnaih, Lecturer	PVKN.GOV.T.College,Chitturu	924852594	drvmstats@gmail.com
Dr.N.Madhavi,Lecturer	GOVT.College(A),Rajahmundry	9951768491	madhavi.au@gmail.com
Dr.A.Kullayaswamy,Lecturer	S.G.College for Degree and PG	8019114632	swamy.anchal@gmail.com
Dr.R.V.S.Prasad,Lecturer	P.R.R.V.S GOVT college ,Vidava	9440493600	drvsvstatnlr@gmail.com
Dr.Devasena,Lecturer	S.S.B.N Degree college,Ananthpur	9441469927	gsd.atp@yahoo.com
Dr.D.V.L.N.Jogiraju,Lecturer	B.V.K.DegreeCollege,Visakhaptanam	9440426883	Jogiraju76@gmail.com
Sri.J.NagaSriram,Lecturer	Govt.College(A),Rajahmundry	7382499623	sriramjonnalagadda2@gmail.com
K.Suneetha,lecturer	Govt.College(A),Rajahmundry	7286038880	sunithakothuri7215@gmail.com
P.Kalyan Kumar, Lecturer	P.R. Govt Collg(A), Kakinada	7013546994	

Signatures

- 1.
- 2.
- 3.
- 4.

Chairman
Board of Studies

Consolidated Report of Board of Studies for the Year 2025-2026

A meeting was conducted for Board of Studies on 15-09-2025 from 10.00 AM for all the semesters under the chairmanship of Dr N.Madhavi (Lecturer-in-charge, Dept of Statistics) with the committee members. The following members were present

S.No.	Name	Member	Signature
1	Dr.N. Madhavi Head, Lecturer in Statistics Dept of Statistics Govt College(A), Rajahmundry	Chairman	
2	Sri N.Srinivasa Rao Lecturer in Statistics Andhra Loyola College, Vijayawada	University Nominee	
3	Prof. B.Muniswamy Head, Dept of Statistics & Director, Population Research Centre Andhra University, Visakhapatnam	Subject Expert	
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6.	Mr.D.Dhanunjaya Rao Research scholar, Dept of statistics Central university, Bihar	Alumnus	
7.	Mr.J.NagaSriram Guest faculty in Statistics Govt college(A),Rajahmundry	Member	
8.	Ms.K.Suneetha Guest faculty in Statistics Govt College(A),Rajahmundry	Member	
9.	Student Members 1. Sh.Reshma ,IIBsc Stat(H) 2. M.Mahesh , IIBsc Stat(H)	Students	
10.	3. S.Sushma , IIBsc Stat(H) 4. B.Lokesh , IIBsc Stat(H)	Students	

The following documents are submitted to the Academic Coordinator and Controller of Examinations

1. Syllabus of I to VI Semesters.
2. Model Question Papers of all the Semesters.
3. Question Banks of all the Semesters.
4. List of Revised Examiners.
5. Any other item with the permission of the chair.

Signatures

- 1.
- 2.
- 3.
- 4.

Chairman
Board of Studies

DEPARTMENT OF STATISTICS
SCHEME OF EVALUATION FOR SEMESTER EXAMINATIONS
(THEORY)

EVALUATIONSCHEME

Standard Operating Procedure for Continuous Internal Assessment (Internal Marks – 50) The Internal marks in all the courses/subjects will be awarded based on continuous internal assessment made during the semester concerned. For each Courses/subject 50 marks are allotted for internal assessment and 50 marks are allotted for the End Semester Examination.

Continuous Internal Evaluation (CIA):

It has been decided to introduce Continuous Internal assessment marks for a total of 50 marks, which are to be distributed as follows:

S.No.	Component		Distribution of Marks
1	CIEI(after completion of 50% of syllabus)		20
2	CIEII(Online Exam)		10
3	ATTENDANCE	Above95%	5
		91%to 95%	4
		86%to 90%	3
		81%to 85%	2
		75%to 80%	1
		Below75%	0
Pedagogical Strategies			
4	Assignment		5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/Quiz/Student Study Project/Field Visit/Survey		5
6	Viva-voce		5
TOTAL			50

DEPARTMENT OF STATISTICS

SCHEME OF VALUATION FOR PRACTICAL EXAMINATIONS

S.No.	Description	Marks
1	Procedure Explanation with Coding(including Algorithm & Flow chart if any)	30
2	VIVAVOCE	10
3	RECORD**	10
4	TOTAL EXTERNAL PRACTICAL EXAM (at the end of I& VI Semester)	50

**Award of marks for number of practicals recorded in the Record.

10 Practical and Above	10
8 Practical	8
6 Practical	6
5 Practical	5
Less than 5	0

Program Specific Outcomes

PROGRAM CODES: B.Sc STATISTICS (HONS)

Sl. No	Program	PSO
1.	B.Sc Stat (Hons)	Acquire core knowledge of the basic concepts of statistics which include the major areas of probability theory, probability distributions, distribution theory, statistical inference, survey sampling, designs of experiments, applied statistics, mathematical methods, non- parametric inference and operations research
2.		Apply the concepts of statistics, Operations Research, Probability theory, Time Series, Designs of Experiment, etc. in real life problems. Practical exercises done will enable students to analyze and interpret data and also to draw valid conclusions. This will enable students to face real time applications.
3.		Apart from this there is a range of Minor Papers in Computer Science, Physics, Economics etc. which students choose as per their interest and aptitude .This enhances theoretical rigor with technical skills which prepare students to become globally competitive to enter into a promising professional life even after graduation.
4.		Understand the applications of statistics concept in other disciplines such as mathematics, computers, economics, etc. and also Provides a platform for pursuing higher studies leading to Post Graduate or Doctorate degrees.

PO-1: Domain Knowledge

CS No	Competency	P I Number	Performance Indicator
1.1	Demonstrate competence in basic concepts of Physics	1.1.1	List out, Define, Describe basic concepts of Physics
		1.1.2	Explain the concepts and underlying principles in various phenomenon
1.2	Have knowledge of Applications of Physics concepts in daily life	1.2.1	Identify the concepts of physics in various daily life phenomenon
		1.2.2	Apply the concepts of physics in various daily life phenomenon
1.3	Basic Problem Solving Techniques	1.3.1	Identify the concept to solve a given problem.
		1.3.2	Solve the problem using the concepts developed
		1.3.3	
1.4	Basic Experimental Demonstration	1.4.1	Design and develop an experiment
		1.4.2	Implement and analyze data
		1.4.3	Interpretation of results

PO-2: Analytical Skills (CSP & INTERNSHIP)

CS No	Competency	P I Number	Performance Indicator
2.1	Demonstrate an ability to identify problems	2.1.1	Articulate problem statements and Identify objectives
		2.1.2	Identify appropriate concepts and systems in an attempt to solve problems
2.2	Demonstrate an ability to formulate, analyse and interpret systems and concepts	2.2.1	Combine principles and applicable concepts to formulate a process suitable to existing requirement / problem
		2.2.2	Identify changes in practice/system and processes in an attempt to provide alternatives to existing processes and systems
2.3	Demonstrate an ability to analyse results, defend position and arrive at Conclusions.	2.3.1	Produce and validate results by applying existing suitable principles
		2.3.2	Identify sources of error in the process
		2.3.3	Prepare conclusions that are consistent to analysis conducted with deep understanding so as to defend the conclusions arrived at.

PO-3: Critical Thinking and complex problem solving (Long term Internship & Project Work)

CS No	Competency	P I Number	Performance Indicator
3.1	Demonstrate an ability to discover and process information in the field.	3.1.1	Make an observation
		3.1.2	Identify a problem
3.2	Demonstrate an ability to consider a wide variety of	3.2.1	Research the Problem (Literature survey)

	viewpoints, clarify and solve problems	3.2.2	Develop hypothesis
		3.2.3	Design an experiment
3.3	Demonstrate an ability to transfer ideas to new context, examine assumptions, assess facts, and explore implications and consequences	3.3.1	Conduct experiment and collect data
		3.3.2	Data visualization
		3.3.3	Analyse the results
		3.3.4	Interpret results and make constructive conclusions

CS No	Competency	P I Number	Performance Indicator
4.1	Modern tool usage and Industry readiness	4.1.1	Demonstrates proficiency in essential software tools (MATLAB, PYTHON etc.)
		4.1.2	Adopts to and independently learns new tools or software to solve real world problems
		4.1.3	Synthesizes industry requirements and provides solutions by identifying suitable criteria of evaluation
		4.1.4	Develops and presents technical reports or case studies that meet industry expectations for clarity, accuracy, and professionalism.
4.2	Individual & Team work	4.2.1	Has interpersonal skills and works effectively in teams/groups.
		4.2.2	Appreciates the value of diversity in teams
		4.2.3	Demonstrates ability towards conflict resolution
4.3	Project management	4.3.1	Project planning, time management and prioritization skills to handle complex industry tasks.
		4.3.2	Participates in and contributes to team projects, demonstrating collaboration and leadership where appropriate.
		4.3.3	Completes a professional project or internship, meeting deadlines and following industry standards.
4.4	Communication skills	4.4.1	Demonstrates effective communication LSRW skills
		4.4.2	Demonstrates effective functional (domain specific) language skills
		4.4.3	Demonstrate Verbal and Nonverbal Communication skills
		4.4.4	Demonstrates clarity and conciseness in delivering messages or speech.
		4.4.5	Seeks feedback and utilizes it for positive growth.

PO-4: Employability skills
PO-5: Ethics, Moral and Spiritual values, IKS

CS No	Competency	P I Number	Performance Indicator
5.1	Human values and Professional Ethics	5.1.1	Demonstrates integrity, honesty, fairness, impartiality, accountability and responsibility
		5.1.2	Demonstrates ethical judgment in decision making
		5.1.3	Respects privacy and confidentiality in handling sensitive data
		5.1.4	Maintains transparency and open communication in projects, team works and research publications.
5.2	Moral and Spiritual values	5.2.1	Identifies personal weaknesses, strengths and how personal beliefs effect daily activities.
		5.2.2	Engages in yoga, meditation and prayer in search of purpose and meaning of own life. Practice mindfulness etc. to relieve stress.
		5.2.3	Participate in community service with compassion and empathy.
		5.2.4	Expresses gratitude in verbal and nonverbal communications, and promotes optimism, positive attitude. Demonstrates empathy in sensitive and challenging conversations.
		5.2.5	Respects unity and diversity in group discussions, team works and projects towards individual beliefs, customs.
5.3	Indian Knowledge system	5.3.1	Demonstrates the ability to explain the cultural and historical significance of IKS such as Ayurveda, Vastu, Yoga, classical arts etc.
		5.3.2	Promotes interdisciplinary research incorporating IKS
		5.3.3	Practices IKS in daily life situations and verify the validity.

PO-6: Lifelong learning

CS No	Competency	P I Number	Performance Indicator
6.1	Lifelong learning	6.1.1	Seeking opportunities for professional development, such as certifications,

			digital badges, workshops, or further study
		6.1.2	Engaging in clubs and study groups, peer reviews, professional networks, Alumni
		6.1.3	Seeking mentorship and coaching
		6.1.4	Volunteering content development, projects and multidisciplinary collaborations.
		6.1.5	Participating in hackathons and other competitions

PO-7: Social and Environmental awareness

CS No	Competency	P I Number	Performance Indicator
7.1	Social Awareness	7.1.1	Engage in debates, discussion forums, clubs, social media communities, campaign programs, documentaries.
		7.1.2	Address social issues effectively considering demographic diversities.
		7.1.3	Develop as a global citizen with local relevance.
		7.1.4	Engaging in Nonprofit or community initiatives, charity events, celebrating awareness days.
		7.1.5	Develop interdisciplinary research on social issues and contribute to policy making
5.2	Environmental Awareness	7.2.1	Engage in green and sustainable campus initiatives, practices and clubs.
		7.2.2	Engage in environmental awareness programs through service, arts and culture, seminars, workshops.
		7.2.3	Engage in multidisciplinary environmental research projects.

2023 – 2024 Curriculum Framework

B.Sc (Honours) with Single Major																								
Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr)			Multi Disny' (2 Cr)			Skill Enhanceme nt Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total		
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr
Sem 1	2*	10	8				2	8	6	1	2	2	2	4	4							7	24	20
Sem 2	2	6+4	8	1	3+2	4	2	8	6				2	4	4							7	27	22
Community Service Project of 180 hours with 4 Credits. Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																								
Sem 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24
Sem 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits. Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																								
Sem 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26
Sem 6	Semester Internship/Apprenticeship/OJT with 12 Credits. Student is eligible for Exit Option-3 with the award of Degree in respective major																							
IKS#																								
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
Sem 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
	21		84	6			24	4		12	3	6	6	10	32	28	2	4	4	2	4	0	47	160
20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship																								
C Courses			H Hours			Cr Credits			OOTC Open Online Transdisciplinary															
IKS#			Indian Knowledge Systems - Audit Course																					

2025 – 2026 Curriculum Framework

Curriculum Framework for B.Sc (Honours) from A.Y. 2025-26 Major + Minor with CSP & 6th sem Internship																								
Semester	Major (4Cr)			Minor (4Cr)			AECC (3Cr)			Multi Disny' (2Cr)			Skill Enhancement Courses(2Cr)			OOTC			(VAC) IKS# Env.Edn* (2 Cr)			Total		
	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr
Sem1	2	6+4	8				2	8	6				1	4+2	4							5	24	18
Sem2	2	6+4	8				2	8	6	1	2	2	1	4+2	4				1#	2	0	7	28	20
Community Service Project of a minimum of 80 hours with 1 Credits. Student is eligible for Exit Option – 1 with the award of Certificate in respective discipline																								
Sem3	3	9+6	12	1	3+2	4	2	8	6	1	2	2	1	2	2							8	32	26
Sem4	3	9+6	12	1	3+2	4				1	2	2	1	2	2							6	24	20
Sem5	1+2	3+2 6+4	12	2	6+4	8													1*	2	2	6	27	22
Sem6	2	6+4	8	2	6+4	8																4	20	16
Internship/Apprenticeship/OJT a minimum of 180 hours (8 weeks) with 3 Credits. Student is eligible for Exit Option-2 with the award of Degree in respective discipline																								
Total	15		60	6			24	6		18	3		6	4		12			1+1			2	36	126

B.Sc.STATISTICS(H) (MAJOR PAPERS) COURSE STRUCTURE

Semester	Paper	Title	Paper Code	Hrs	Credits	CIA	SEE	Total
FIRST YEAR								
I	Skills	Artificial Intelligence (AI) Fundamentals	...	2	2	-	50	50
	Major-1	Descriptive Statistics	225901	5	4	50	50	100
		Descriptive Statistics Practical	225901 P	5	4	50	50	100
	Major-2	Random Variable and Mathematical Expectations	225902	2	2	-	50	50
		Random Variable and Mathematical Expectations Practical	225902 P	5	4	50	50	100
II	Skills	Artificial Intelligence (AI) Fundamentals	...	2	2	-	50	50
	Major-1	Theoretical Discrete Distributions	225903	5	4	50	50	100
		Theoretical Discrete Distributions Practical	225903 P	2	2	-	50	50
	Major-2	Theoretical Continuous Distributions	225904	5	4	50	50	100
		Theoretical Continuous Distributions Practical	225904 P	2	2	-	50	50
SECOND YEAR								
III	MDC	Principles of Management	...	2	2	-	50	50
	LSC	Information and Communication Technology	...	2	2	-	50	50
	Major-1	Theoretical Discrete Distributions	225905	5	4	50	50	100
		Theoretical Discrete Distributions Practical	225905 P	2	2	-	50	50
	Major-2	Theoretical Continuous Distributions	225906	5	4	50	50	100
		Theoretical Continuous Distributions Practical	225906 P	2	2	-	50	50

	Major-3	Statistical Methods	225907	5		50	50	100
		Statistical Methods Practical	225907 P	2	2	-	50	50
	Major-4	Statistical Inference	225908	5	4	50	50	100
		Statistical Inference Practical	225908 P	2	2	-	50	50
IV	MDC	Skill	...	2	2	-	50	50
	LSC	Cyber Security	...	2	2	-	50	50
	Major-1	Theory of Sampling	225909	5	4	50	50	100
		Theory of Sampling Practical	225909 P	2	2	-	50	50
	Major-2	Design of Experiments	225910	5	4	50	50	100
		Design of Experiments Practical	225910P	2	2	-	50	50
	Major-3	Numerical Analysis	225911	5	4	50	50	100
		Numerical Analysis Practical	225911P	2	2	-	50	50
THIRD YEAR								
V	-	Long team Internship	-	-	-	-	-	-
VI	Skill		...	2	2	-	50	50
	Major-1	Applied Statistics	225912	5	4	50	50	100
		Applied Statistics Practical	225912 P	2	2	-	50	50
	Major-2	Computational Techniques & R Programming	225913	5	4	50	50	100
		Computational Techniques & R Programming Practical	225913 P	2	2	-	50	50
	Major-3	Operation Research	225914	5	4	50	50	100
		Operation Research Practical	225914 P	2	2	-	50	50
	Major-4	Optimization Techniques	225915	5	4	50	50	100
		Optimization Techniques Practical	225915 P	2	2	-	50	50

B.Sc. COMPUTATIONAL MATHEMATICS (MINOR PAPERS) COURSE STRUCTURE

Semester	Paper	Title	Paper Code	Hrs	Credits	CIA	SEE	Total
FIRSTYEAR								
II

SECOND YEAR								
III	Minor-1	Statistical Methods		5	4	50	50	100
		Statistical Methods Practical		2	2	-	50	50
IV	Minor-1	Theory of Sampling		5	4	50	50	100
		Theory of Sampling Practical		2	2	-	50	50
	Minor-2	Design of Experiments		5	4	50	50	100
		Design of Experiments Practical		2	2	-	50	50
THIRD YEAR								
V	Minor	Long team Internship	-	-	-	-	-	-
VI	Minor-1	Applied Statistics		5	4	50	50	100
		Applied Statistics Practical		2	2	-	50	50
	Minor-2	Computational Techniques and R Programming		5	4	50	50	100
		Computational Techniques and R Programming Practical		2	2	-	50	50

COMMUNITY SERVICE PROJECT/INTERNSHIP/ON THE JOB TRAINING/APPRENTICESHIP- STRUCTURE

Semester	Title	Credits	Duration	Total Marks
After I year Examinations	Community Survey Project	4	8 Weeks	100
After II year Examinations	Apprenticeship /Internship/On the job training/ In-house Project/Off-site Project	4	8 Weeks	100
SEM V / VI	Apprenticeship/Internship /On the Job Training	12	3Months	200



GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
Estd: 1853; An Autonomous Institution & Accredited by NAAC at Grade 'A+'
East Godavari District -533 105, Andhra Pradesh, India
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I B.Sc. Statistics (HONOURS)



DEPARTMENT OF STATISTICS

SEMESTER – I & II

SYLLABUS

MODEL PAPERS & QUESTION BANKS

SEMESTER-I

MAJOR/MINOR	COURSE
	I BSC STATISTICS (HONOURS)
SKILL	Artificial Intelligence (AI) Fundamentals
MAJOR - I	M1:Descriptive Statistics
MAJOR - II	M2:Random Variable and Mathematical Expectations

SEMESTER-I

COURSE 1: **Artificial Intelligence (AI) Fundamentals**

Theory Credits: 3

3 hrs/week

Learning Objectives:

1. Understand the history and evolution of Artificial Intelligence and Identify major subfields of AI.
2. Investigate the role of AI in various industries like healthcare, agriculture, and education.
3. Examine concepts like bias, fairness, transparency, and accountability in AI systems.
4. Explore the integration of AI in scientific research & discuss future directions, evolving trends in AI.
5. Learn how prompt engineering is used in various sectors like education and content creation.

Course Outcomes:

Students will be able to

1. Describe the different subfields and their roles in AI applications.
2. Analyze the benefits and limitations of AI in diverse domains.
3. Evaluate AI systems in terms of inclusivity, privacy, and robustness.
4. Describe Generative AI and emerging technologies like ChatGPT.
5. Apply prompt engineering concepts to various real-world use cases.

Syllabus

Unit I -AI and its Subfields :

Introduction to Artificial Intelligence, History, Definition, Artificial General Intelligence, Industry Applications of AI, Challenges in AI. Knowledge Engineering, Machine Learning, Computer Vision, Natural Language Processing, Robotics.

Unit 2 -Applications of AI :

Healthcare, Finance, Retail, Agriculture, Education, Transportation.

Unit 3 -Bias and Fairness in AI Systems:

Ethics in AI, Bias and Fairness in AI Systems, Transparency in AI Systems, Accountability, Security, Privacy, Inclusivity, Sustainability, Robustness, Reliability.

Unit 4 -AI in Research, Generative AI and prompt engineering:

AI in Experimentation and Multi-disciplinary research, Generative AI introduction, ChatGPT, Hugging Face, Gemini and other tools basics, Perplexity, Prompt engineering Definition and its importance, Role of Prompt Engineering in AI/ML Interaction, Emerging trends and Future Directions in AI.

Unit 5 - Applications of Prompt engineering:

Applications of Prompt Engineering: Education, Business & Commerce, Content Creation: AI for Creative Writing, AI for creative design, writing AI scripts for video, generating slides and slidesGPT usage, Designing thumbnails and channel branding with AI

Text Books:

1. AI for Everyone: A Beginner's Handbook for Artificial Intelligence (AI) by Saptarsi Goswami, Amit Kumar Das , Amlan Chakrabarti
2. Prompt Engineering for Beginners: by Kapila Arora, Geetu Garg, Gaurav Arora.

SEMESTER-I

COURSE 1: **Artificial Intelligence (AI) Fundamentals**

Practical Credits: 1

2 hrs/week

1. Create a mind map of AI subfields: NLP, CV, ML, Robotics, Knowledge Engineering using Canva/Napkin AI/ Similar Open AI tool
2. Text Analysis with Open-Source NLP Tools: Tool: Voyant Tools (text analysis web app)
 - Input sample texts (e.g., news articles, speeches).
 - Explore word frequency, keywords, sentiment.
 - Understand how NLP extracts meaning from text.
3. Train a basic image classifier using webcam images. Observe how the model "learns." Using Google Teachable Machine
 - Train two image categories (e.g., "Smiling" vs. "Not Smiling") using their own webcam images.
 - Observe how the model learns to classify.
 - Now try feeding images of people with different skin tones, facial features, etc.
 - Observe misclassifications or differences in confidence.
4. Simulate an AI chatbot helping a farmer or a student. You may use any GenAI tool of your choice. You may use the prompt below and also try your own. Prompt:
"Act as an agriculture assistant. A farmer wants to know the best crop based on soil and season. Ask questions and suggest crops."
5. Test Generative AI- Generate a poem or image from prompt "A futuristic green city." using ChatGPT, Hugging Face (e.g., image or text generation)
6. Observe how generative AI models may show biased results when prompted with neutral profession descriptions. (Bing Image Creator / DALL·E on ChatGPT/ChatGPT). Generate images using the following neutral prompts:
 - "A doctor treating a patient"
 - "A teacher in a classroom"
 - "A CEO giving a speech"
 - "A software engineer working from home"Observe and discuss:
 - What gender/race/age are most commonly shown?
 - Are the results stereotypical or diverse?
7. Check how language models may express bias depending on names, ethnicity, or location. Use ChatGPT or Gemini

Prompts:

Prompt A:

"A person named Raj is applying for a bank loan. Will he be approved?"

Prompt B:

"A person named John is applying for a bank loan. Will he be approved?"

Change names, genders, and nationalities.

Observe the following and report your findings:


- Are the responses different?
- Is one version more positive or negative?
- Does the model express bias or hesitate?
- Should AI make such predictions?
- How do developers prevent this?

8. Exploring Text Generation and Summarization with Google AI Studio

Generate Creative Content

"Write a short story (150 words) about a robot who wants to become a chef."

- Submit and read the AI-generated story

	GOVERNMENT COLLEGE(AUTONOMOUS) RAJAHMUNDRY	Program & Semester I BSC(Sem-I) MAJOR PAPER			
Course Code 225914	TITLE OF THE COURSE COURSE 1: DESCRIPTIVE STATISTICS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Science	0	3	2	3

Course Objectives:

1. To build the basis for promoting various statistical methods theoretically and their applications in study of multidisciplinary sciences by emphasizing real life problems.
2. To inculcate statistical thinking and computer approach towards statistical methods, tools and techniques among the students.
3. To develop skills in handling complex problems in data analysis and research design.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the role of statistics in different fields with special reference to business and economics.
CO2	To review good practice in presentation and the format most applicable to their own data.
CO3	To learn the measures of central tendency or averages reduce the data to a single value which is highly useful for making comparative studies.
CO4	To be familiar with the measures of dispersion throw light on reliability of average and control of variability.
Co5	To deal with the situation where there is uncertainty and to measure that uncertainty by using probability, which is essential in all research areas.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Statistical Description of Data:

Statistical Description of Data Origin, history and definitions of Statistics. Importance, Scope and limitations Statistics. Function of Statistics – Collection, Presentation, Analysis and Interpretation. Collection of data – primary and secondary data and its methods. Classification of data – Quantitative, Qualitative, Temporal, Spatial. Presentation of data – Textual, Tabular – essential parts.

Unit – 2: Measurement Scales:

Measurement Scales – Nominal, Ordinal, Ratio and Interval. Frequency distribution and types of frequency distributions, forming a frequency distribution. Diagrammatic representation of data – Histogram, Bar, Multiple bar and Pie with simple problems. Graphical representation of data: Histogram, frequency polygon and Ogives with simple problems.

Unit – 3: Measures of Central Tendency (MCT):

Arithmetic Mean – properties, methods. Median, Mode, Geometric Mean (GM), Harmonic Mean (HM). Calculation of mean, median, mode, GM and HM for grouped and ungrouped data. Median and Mode through graph. Empirical relation between mean, median and mode. Features of good average.

Unit – 4: Measures of Dispersion:

Concept and problems – Range, Quartile Deviation, Mean Deviation and Standard Deviation and their coefficients, Variance and its applications viz. Business and Pharmacy etc.

Unit – 5: Moments:

Central and Non – Central moments and their interrelationship, Problems. Sheppard's correction formoments and problems. Skewness and its methods, kurtosis and related problems

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Referencebooks:

1. O. P. Gupta: Mathematical Statistics, Kedarnath Ramnath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester I BSC(Sem-I) MAJOR PAPER			
Course Code 225914 P	TITLE OF THE COURSE COURSE 1: DESCRIPTIVE STATISTICS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Calculation of moments of univariate random variable to the given pmf.
2. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pmf.
3. Calculation of moments of univariate random variable to the given pdf.
4. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pdf.
5. Problem related to jpmf, mpmf and conditional pmf and its independence.
6. Problem related to jpdf, mpdf and conditional pdf and its independence.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedarnath Ramnath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd

Virtual Lab Links:

GOVERNMENT COLLEGE(A) RAJAHMUNDRY
CBCS SYLLABUS (Semester Wise) 2025-26

I B.Sc Statistics/Semester-I

Course-1: DESCRIPTIVE STATISTICS (MAJOR PAPER)
MODEL PAPER

Time: 2 1/2 hrs.

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5X4= 20M

- | | | | | |
|----|---|-----|-----|-----|
| 1 | Explain about limitation of statistics. | BT1 | PO1 | CO2 |
| 2 | Write about classification of data. | BT3 | PO5 | CO2 |
| 3 | Analyze about nominal and ordinal measurement of scale. | BT2 | PO3 | CO3 |
| 4 | Explain about properties of A.M | BT1 | PO2 | CO3 |
| 5 | Show that Karl pearson coefficient of skewness lies between ± 3 . | BT3 | PO2 | CO5 |
| 6 | Explain the Presentation of data | BT3 | PO1 | CO5 |
| 7 | Explain the Mean Deviation | BT3 | PO2 | CO5 |
| 8. | Explain about kurtosis and types. | BT2 | PO2 | C04 |

SECTION – B

Answer Any THREE questions.


3X10=30M

- | | | | | |
|----|--|-----|-----|-----|
| 9 | Explain about scope of Statistics. | BT1 | PO2 | C01 |
| 10 | Illustrate about graphical representation of data. | BT1 | PO1 | CO2 |
| 11 | Describe briefly about measures of central tendency. | BT2 | PO2 | CO3 |
| 12 | Explain in detailed about measures of dispersion | BT1 | PO2 | CO3 |
| 13 | Explain about moments and its types. | BT2 | PO1 | C04 |
| 14 | Central and Non – Central moments and their interrelationship. | BT2 | PO2 | C04 |

I B.Sc Statistics/Semester-I
Course I: DESCRIPTIVE STATISTICS (MAJOR PAPER)
Question Bank

S.N	Short Questions	BT	PO'S	CO'S												
1	Illustrate function of statistics.	BT1	PO2	C01												
2	Describe importance of statistics.	BT3	PO3	C01												
3	Evaluate median of the following data <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>C.I</td> <td>20-30</td> <td>30-40</td> <td>40-50</td> <td>50-60</td> <td>60-70</td> </tr> <tr> <td>FRE</td> <td>3</td> <td>5</td> <td>20</td> <td>10</td> <td>5</td> </tr> </table>	C.I	20-30	30-40	40-50	50-60	60-70	FRE	3	5	20	10	5	BT2	P02	C02
C.I	20-30	30-40	40-50	50-60	60-70											
FRE	3	5	20	10	5											
4	Explain about limitation of statistics.	BT1	PO1	CO2												
5	Determine about frequency distribution.	BT3	PO4	CO3												
6	Explain about types of frequency distribution.	BT2	PO2	CO3												
7	Analyze about nominal and ordinal measurement of scale.	BT2	PO3	CO3												
8	Explain about properties of A.M	BT1	PO2	CO3												
9	Explain about classification of data.	BT3	PO5	CO2												
10	Describe about features of good average.	BT3	PO3	CO3												
11	Explain about sheppards correction for moments.	BT2	PO1	C04												
12	Explain about kurtosis and types.	BT2	PO2	C04												
13	Describe about law moments in terms of central moments.	BT1	PO3	CO5												
14	Show that Bowley's coefficient of skewness lies between ± 1	BT3	PO1	CO5												
15	Show that Karl pearson coefficient of skewness lies between ± 3 .	BT3	PO2	CO5												

S.N	Long Questions	BT	PO'S	CO'S												
1	Explain about scope of Statistics.	BT1	PO2	C01												
2	Write about Primary and secondary data.	BT3	PO3	C01												
3	Describe about Presentation of data..	BT2	P02	C02												
4	Illustrate about graphical representation of data.	BT1	PO1	CO2												
5	Explain about diagram representation of data.	BT3	PO4	CO3												
6	Describe briefly about measures of central tendency.	BT2	PO2	CO3												
7	Calculate mean to the following data <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Marks</td> <td>10-20</td> <td>20-30</td> <td>30-40</td> <td>40-50</td> <td>50-60</td> </tr> <tr> <td>Frequency</td> <td>5</td> <td>8</td> <td>25</td> <td>22</td> <td>10</td> </tr> </table>	Marks	10-20	20-30	30-40	40-50	50-60	Frequency	5	8	25	22	10	BT2	PO3	CO3
Marks	10-20	20-30	30-40	40-50	50-60											
Frequency	5	8	25	22	10											
8	Explain in detailed about measures of dispersion	BT1	PO2	CO3												
9	Calculate mean derivation about median to the following data <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>C.I</td> <td>10-20</td> <td>20-30</td> <td>30-40</td> <td>40-50</td> <td>50-60</td> </tr> <tr> <td>F</td> <td>5</td> <td>10</td> <td>15</td> <td>10</td> <td>5</td> </tr> </table>	C.I	10-20	20-30	30-40	40-50	50-60	F	5	10	15	10	5	BT3	PO4	CO3
C.I	10-20	20-30	30-40	40-50	50-60											
F	5	10	15	10	5											
10	Explain about skewness and measures of skewness.	BT4	PO5	CO4												
11	Explain Standard Deviation its problem	BT3	PO3	CO3												
12	Central and Non – Central moments	BT2	PO1	C04												
13	Explain about sheppards correction for moments	BT2	PO2	C04												
14	Frequency distribution and types of frequency distributions	BT1	PO3	CO5												
15	Describe briefly about measures of central tendency.															

	GOVERNMENT COLLEGE(AUTONOMOUS) RAJAHMUNDRY	Program & Semester I BSC(Sem-I) MAJOR PAPER			
Course Code 225915	TITLE OF THE COURSE COURSE2:RANDOMVARIABLESANDMATHEMATICAL EXPECTATIONS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To deal with the data by the basic discrete distributions such as Uniform and Binomial distributions.
2. To acquaint the Poisson distribution applications.
3. To learn about the Negative Binomial distribution and its applications towards the real life problems.
4. To familiar with dealing the data by Geometric and Hyper Geometric distributions.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the role of statistics in dealing with the univariate random variables.
CO2	To learn the extension of the univariate data to bivariate data.
CO3	To learn the measure of randomness mathematically by using expectations.
CO4	To get the familiarity about the generating functions, law of large numbers and central limit theorem, further to apply in research and allied fields.
CO5	To learn different applications of distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Elementary Probability:

Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events, Addition and multiplication theorems of probability for 2 and for n events and simple problems. Boole's inequality, Bayes theorem and its applications in real life problems.

Unit – 2: Univariate Random Variables:

Definition of random variable (r.v.), discrete and continuous random variables, functions of random variable. Probability mass function, Probability density function, Distribution function and its properties. Calculation of moments, coefficient of skewness and kurtosis for a given pmf and pdf.

Unit – 3: Bivariate Random Variables:

Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables and simple problems.

Unit – 4: Mathematical Expectation:

Mathematical expectation of function a random variable. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Properties of expectations, variance, covariance. Chebyshev and Cauchy-Schwartz inequalities and their applications.

Unit – 5: Generating functions:

Definitions of Moment Generating Function, Cumulant Generating Function, Characteristic Function and Probability Generating Function and their properties. Weak Law of Large Numbers (WLLN), Strong Law of Large Numbers (SLLN). Convergence in probability and convergence in distribution, concept of Central limit theorem.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd..

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organization etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester I BSC (Sem-I) MAJOR PAPER			
Course Code 225915 P	TITLE OF THE COURSE COURSE-2: RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Calculation of moments of univariate random variable to the given pmf.
2. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pmf.
3. Calculation of moments of univariate random variable to the given pdf.
4. Calculation of coefficient of skewness and kurtosis of univariate random variable to the given pdf.
5. Problem related to jpmf, mpmf and conditional pmf and its independence.
6. Problem related to jpdf, mpdf and conditional pdf and its independence.
7. Chebyshev's inequality application oriented problems.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O.P. Gupta: Mathematical Statistics, Kedar Nath Ramnath & Co.
3. P.N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol III, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Virtual Lab Links:

GOVERNMENT COLLEGE(A) RAJAHMUNDRY
CBCS SYLLABUS (Semester Wise) 2025-26

I B.Sc Statistics/Semester-I

COURSE-2: RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

- | | | | | |
|----|--|-----|-----|-----|
| 1 | Write short note on Random variables? | BT1 | PO1 | CO2 |
| 2 | Explain Cauchy - Schwartz inequalities | BT3 | PO5 | CO2 |
| 3 | Explain p.m.f and p.d.f ? | BT2 | PO3 | CO3 |
| 4 | Explain Bi-variate Random Variables? | BT1 | PO2 | CO3 |
| 5 | Explain CF and its Properties? | BT3 | PO2 | CO5 |
| 6 | Explain Population, sample with examples | BT3 | PO1 | CO5 |
| 7 | What are WLLN? | BT3 | PO2 | CO5 |
| 8. | What is Lindberg – Levy CLT? | BT2 | PO2 | C04 |

SECTION – B

Answer Any THREE questions.

3X10=30M

- 9 1. A random variable X has the following function BT1 PO2 CO1

X	-2	-1	0	1	2	3
P(X)	0.1	K	0.2	2K	0.3	K

Find (i) Mean and variance
(ii) Construct distribution function and draw its graph

- | | | | | |
|----|---|-----|-----|-----|
| 10 | Explain Distribution function and its properties ? | BT1 | PO1 | CO2 |
| 11 | Explain i) $E(X+Y) = E(X)+E(Y)$
ii) $E(XY) = E(X)E(Y)$ | BT2 | PO2 | CO3 |
| 12 | Explain Chebyshev Inequality | BT1 | PO2 | CO3 |
| 13 | Explain MGF and its Properties | BT2 | PO1 | C04 |
| 14 | Explain about concept of Central limit theorem? | BT2 | PO2 | C04 |

I B.Sc Statistics/Semester-I

Course – 2 :RANDOM VARIABLES AND MATHEMATICAL EXPECTATIONS (MAJOR PAPER)


Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Explain about random variables and its types .	BT1	PO2	C01
2	Describe the important properties of a random variable.	BT3	PO3	C01
3	Demonstrate P.M.F and P.D.F.	BT2	P02	C02
4	Explain about bi variate discrete random variable.	BT1	PO1	CO2
5	Describe about continuous random variable	BT3	PO4	CO3
6	Write about PDF in bi variate random variable	BT2	PO2	CO3
7	Explain about MDF in bi variate random variable	BT2	PO3	CO3
8	State and prove additional theorem in expectation	BT1	PO2	CO3
9	State and prove multiplication theorem in expectation for two events	BT3	PO5	CO2
10	State and prove Cauchy-schwartz in equalities.	BT3	PO3	CO3
11	Explain about moment generating function and definition	BT2	PO1	C04
12	Define characteristic function and write its properties	BT2	PO2	C04
13	Describe about weak-law of large number	BT1	PO3	CO5
14	Explain Bi-variate Random Variables?	BT3	PO1	CO5
15	Write about statement of central limit theorem	BT3	PO2	CO5

S.N	Long Questions	BT	PO'S	CO'S														
1	For a continuous random variable x $F(x)=k \cdot x^2 e^{-x}, x \geq 0$ (i) K (ii) S.D (iii) Mean(iv) variance	BT1	PO2	C01														
2	Define distribution function in uni variate random variable and explain properties	BT2	PO3	CO3														
3	A random variable x has the following probability function <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>P(x)</td> <td>0.1</td> <td>k</td> <td>0.2</td> <td>2k</td> <td>0.3</td> <td>k</td> </tr> </table> Find (i) K,(ii) Mean and variance	x	-2	-1	0	1	2	3	P(x)	0.1	k	0.2	2k	0.3	k	BT1	PO2	CO3
x	-2	-1	0	1	2	3												
P(x)	0.1	k	0.2	2k	0.3	k												
4	The joint probability distribution of x and y is given below Find (i) Marginal distributions (ii) Conditional distribution of y given x=2 (iii) $P(x+y < 4)$ (iv) $P(x > 1), P(y < 2)$ <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>y/x</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>1</td> <td>0.1</td> <td>0.1</td> <td>0.2</td> </tr> <tr> <td>2</td> <td>0.2</td> <td>0.3</td> <td>0.1</td> </tr> </table>	y/x	1	2	3	1	0.1	0.1	0.2	2	0.2	0.3	0.1	BT3	PO3	C01		
y/x	1	2	3															
1	0.1	0.1	0.2															
2	0.2	0.3	0.1															
5	Describe about distribution function of bi variate random variables	BT2	P02	C02														
6	Explain i) $E(X+Y)= E(X)+E(Y)$ ii) $E(XY)=E(X)E(Y)$	BT1	PO1	CO2														
7	State and prove additional theorem of expectation for n events	BT3	PO4	CO3														
8	Define variance and explain its properties.	BT2	PO2	CO3														
9	Explain MGF and its Properties	BT2	PO3	CO3														
10	State and prove a multiplication theorem of expectation for n events	BT1	PO2	CO3														
11	State and prove chebyshev in equality	BT3	PO4	CO3														
12	Explain about moments generating function and its properties	BT2	PO5	CO4														
13	Describe about moment cumulative generating and its properties	BT3	PO3	CO3														
14	Define about moment probability generating and its properties	BT2	PO1	C04														
15	Define (a)sample space (b) exhaustive events (c) exclusive events (d) favorable outcomes.	BT2	PO2	C04														

SEMESTER-II

MAJOR/MINOR	COURSE
	I BSC STATISTICS (HONOURS)
SKILL	ARTIFICIAL INTELLIGENCE (AI) FUNDAMENTALS
MAJOR - III	M3 : THEORETICAL DISCRETE DISTRIBUTION
MAJOR - IV	M4 : THEORETICAL CONTINUOUS DISTRIBUTION

	Government College (Autonomous) Rajahmundry	Program & Semester I BSC (Sem-II) MAJOR PAPER			
Course Code 225903	TITLE OF THE COURSE COURSE3:Theoretical Discrete Distributions				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in basic Probability and Random variable concept	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To deal with the data by the basic discrete distributions such as Uniform and Binomial distributions.
2. To acquaint the Poisson distribution applications.
3. To learn about the Negative Binomial distribution and its applications towards the real life problems.
4. To familiar with dealing the data by Geometric and Hyper Geometric distributions.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To deal with the data by the basic discrete distributions such as Uniform and Binomial distributions.
CO2	To acquaint the Poisson distribution applications.
CO3	To learn about the Negative Binomial distribution and its applications towards the real life problems.
CO4	To familiar with dealing the data by Geometric and Hyper Geometric distributions.
Co5	<input type="checkbox"/> To learn different applications of distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Uniform, Bernoulli and Binomial distributions:

Discrete Uniform distribution – definitions, mean, variance. Bernoulli distribution – definitions, mean, variance and its mgf. Binomial distribution – Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities, limiting case of Binomial Distribution to Normal distribution.

Unit – 2: Poisson Distribution:

Poisson distribution - Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities. Poisson distribution as a limiting case of Binomial distribution, limiting case of Poisson Distribution to Normal distribution.

Unit – 3: Negative Binomial Distribution:

Negative Binomial Distribution - Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities. Limiting case of Negative Binomial Distribution to Normal distribution.

Unit – 4: Geometric Distribution:

Geometric Distribution – Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, Lack of memory property. Recurrence relation for probabilities.

Unit – 5: Hyper Geometric Distribution:

Hyper Geometric Distribution – Definition, mean and variance, problems. Recurrence relation for probabilities. Limiting case of Hyper Geometric distribution to Binomial distribution.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Referencebooks:

1. O. P. Gupta: Mathematical Statistics, Kedar Nath Ram Nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd Web Links

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester I BSC (Sem-II) MAJOR PAPER			
Course Code 225903P	TITLE OF THE COURSE COURSE3: Theoretical Discrete Distributions				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Probability	0	0	2	1

List of Experiments:

1. Fitting of Binomial distribution – Direct method.
2. Fitting of Binomial distribution – Recurrence relation Method.
3. Fitting of Poisson distribution – Direct method.
4. Fitting of Poisson distribution – Recurrence relation Method.
5. Fitting of Negative Binomial distribution – Direct method.
6. Fitting of Negative Binomial distribution – Recurrence relation Method.
7. Fitting of Geometric distribution – Direct method.
8. Fitting of Geometric distribution – Recurrence relation Method.
9. Fitting of Hyper Geometric distribution

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts on those topics.
7. Visits/field trips of firms, research organizations etc

Reference books:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O.P. Gupta: Mathematical Statistics, Kedar Nath Ramnath & Co.
3. P.N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol III, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
I B.Sc Statistics/Semester-II
COURSE3: Theoretical Discrete Distributions (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

1. Define Bernoulli distribution? BT1,PO2,C01
2. Explain about Binomial distribution? BT2,PO2,C04
3. Define Poisson distribution? BT3,PO5,C02
4. Explain Additive Property Of Geometric Distribution? BT2,PO2,C02
5. Define Geometric distribution? BT3,PO4,C03
6. Discuss about MGF and CF of Binomial Distribution? BT1,PO2,C01
7. ExplainMGF and CGF of Geometric Distribution? BT1,PO2,C05
8. Explain Hypergeometric Distribution BT1,PO2,C03

SECTION-B

Answer any THREE questions

3X10=30M

9. Explain Binomial Distribution and its Additive Property BT1,PO2,C01
10. Fit a Poisson Distribution for the following data BT1,PO2,C02


X	0	1	2	3	4	5	6	7
F	0	4	13	28	42	20	6	2

11. Explain Mean and Variance though mgf of Geometric Distribution BT1,PO2,C03
12. Explain Moments of Poisson Distribution BT1,PO2,C02
13. Lack of memory property of Geometric Distribution BT1,PO2,C04
14. Explain about HyperGeometricDistribution BT1,PO2,C05

I B.Sc Statistics/Semester-II
Course 3: Theoretical Discrete Distributions (Major Paper)
Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Define Bernoulli distribution?	BT1	PO2	C01
2	Explain about Binomial distribution?	BT3	PO3	C01
3	Define Poisson distribution?	BT3	PO1	CO5
4	Describe Mgf,Cf,Cgf&Pgf ofPoisson distribution?	BT3	PO2	CO5
5	Define Geometric distribution?	BT2	PO1	C04
6	Discuss Describe Mgf,Cf,Cgf&Pgf of Binomial Distribution?	BT1	PO1	CO2
7	Explain Assumptions of Poisson distribution?	BT1	PO2	C01
8	Explain Assumptions of Binomial distribution?	BT2	PO2	CO3
9	Describe Mgf,Cf,Cgf&Pgf ofGeometric distribution	BT2	PO2	C04
10	Explain Additive Property ofBinomial Distribution	BT2	PO3	CO3
11	Fit a Binomial Distribution for the following data	BT1	PO2	CO3
12	Explain Additive Property Of PoissonDistribution	BT3	PO5	CO2
13	Explain Poisson distribution as a limiting cases	BT3	PO3	CO3
14	Explain Additive Property of GeometricDistribution	BT2	PO1	C04
15	Explain about HyperGeometricDistribution	BT2	PO2	C04

S.n	Long Questions	BT	PO'S	CO'S																		
1	Define Moments of Binomial distribution?	BT1	PO2	C01																		
2	Explain Mean and Variance through MGF of Binomial distribution?	BT3	PO1	CO5																		
3	Define Moments of Poisson distribution?	BT3	PO3	C01																		
4	Describe Mean and Variance through MGF of distribution?	BT2	P02	C02																		
5	Define Moments of Geometric distribution?	BT1	PO3	CO5																		
6	Explain Mean and Variance through MGF of Geometricdistribution?	BT3	PO4	CO3																		
7	Fit a Poisson Distribution for the following data	BT1	PO1	CO2																		
	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>F</td> <td>0</td> <td>4</td> <td>13</td> <td>28</td> <td>42</td> <td>20</td> <td>6</td> <td>2</td> </tr> </table>	X	0	1	2	3	4	5	6	7	F	0	4	13	28	42	20	6	2			
X	0	1	2	3	4	5	6	7														
F	0	4	13	28	42	20	6	2														
8	Fit a Geometric Distribution for the following data	BT3	PO4	CO3																		
	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>F</td> <td>8</td> <td>7</td> <td>12</td> <td>20</td> <td>32</td> <td>18</td> </tr> </table>	X	1	2	3	4	5	6	F	8	7	12	20	32	18							
X	1	2	3	4	5	6																
F	8	7	12	20	32	18																
9	Define Limiting case of Binomial distribution to Normal distribution	BT2	PO2	CO3																		
10	Define Limiting case of Poisson distribution to Normal distribution	BT3	PO3	CO3																		
11	Binomial Distribution As a limiting case of hyper geometric distribution	BT2	PO1	C04																		
12	ExplainAssumptions and applications of Geometricdistribution	BT2	PO2	C04																		
13	Explain LimitingcaseofNegative Binomial Distribution toNormal distribution?	BT2	PO3	CO3																		
14	Explain Mgf,Cf,Cgf&Pgf ofGeometric distribution	BT1	PO2	CO3																		
15	Explain Lack of memory property of Geometric Distribution	BT3	PO5	CO2																		

	Government College (Autonomous) Rajahmundry	Program & Semester I BSC (Sem-II) MAJOR PAPER			
Course Code 225904	TITLE OF THE COURSE COURSE4: <i>Theoretical Continuous Distributions</i>				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Probability and Random variables	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To deal with the data by the basic continuous distribution such as Uniform Binomial distribution.
2. To acquaint the Exponential distribution applications.
3. To learn about the Gamma and Beta distributions and their applications towards the real life problems.
4. To get familiarity of the most important distributions such as Normal and Standard Normal distribution and their applications in research and various fields.
5. To acquire the knowledge of exact sampling distributions

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To deal with the data by the basic continuous distributions such as Uniform Binomial distribution.
CO2	To acquaint the Exponential distribution applications.
CO3	To learn about the Gamma and Beta distributions and their applications towards the real life problems.
CO4	To get familiarity of the most important distributions such as Normal and Standard Normal distribution and their applications in research and various fields.
Co5	To acquire the knowledge of exact sampling distributions.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Continuous Uniform distribution:

Uniform distribution – Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and Distribution function. Mean Deviation about mean.

Unit – 2: Exponential Distribution:

Exponential distribution – Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and Distribution function. Memory less property.

Unit – 3: Gamma and Beta Distributions:

Gamma Distribution - Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and additive property. Limiting form of gamma distribution.

Beta Distribution of first and second kind – Definition, mean, variance and harmonic mean.

Unit – 4: Normal Distribution:

Normal Distribution – Definition, properties, importance, M.G.F, C.F, C.G.F, additive property, skewness, kurtosis and problems. Obtain mean, median and mode, Even and Odd order moments about mean, linear combination of normal variates, points of inflexion of normal probability curve.

Unit – 5: Standard Normal and Sampling Distributions:

Standard Normal Distribution – Definition, mgf, mean and variance, Area property, problems. Concept of Population, Sample, Parameter, Statistic, Sampling Distribution. Student's t – distribution, F – Distribution, χ^2 – Distribution: Definitions, properties and their applications.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd Web Links

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester I BSC (Sem-II) MAJOR PAPER			
Course Code 225904P	TITLE OF THE COURSE COURSE4: Theoretical Continuous Distributions				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Probability and Random variables	0	0	2	1

List of Experiments:

1. Calculation of moments of Uniform distribution.
2. Calculation of skewness and kurtosis of Uniform distribution.
3. Fitting of Exponential distribution.
4. Gamma distribution application-oriented problems.
5. Fitting of Normal distribution – Areas method.
6. Fitting of Normal distribution – Ordinates method.
7. Problems related to Standard Normal distribution.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts on those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O.P. Gupta: Mathematical Statistics, Kedar Nath Ramnath & Co.
3. P.N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol III, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
I B.Sc Statistics/Semester-II
COURSE4: Theoretical Continuous Distributions (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

1. Write short note on Continuous Random variables BT1,PO1,CO1
2. Explain applications of Uniform Distribution? BT2,PO1,CO5
3. Describe MGF of Exponential distribution. BT3,PO2,CO5
4. Explain Applications of Normal Distribution BT3,PO1,CO2
5. Explain Distribution Function of Exponential Distribution BT1,PO2,CO5
6. Explain Application and properties of t Distribution. BT2,PO2,CO3
7. Explain Applications of Beta Distribution BT3,PO2,CO5
8. Explain about χ^2 -Distribution BT1,PO1,CO5

SECTION-B

Answer any THREE questions

3X10=30M

9. Explain Moments of Rectangular Distribution BT3,PO1,CO1
10. Explain Moments of Exponential Distribution BT2,PO1,CO2
11. Explain It's Functions of Exponential Distribution Mgf,Cf&Cgf BT1,PO1,CO3
12. Describe briefly about the Beta distribution of second kind and derive it's mean and variance.
13. Lack of memory property of Exponential distribution BT3,PO1,CO3
14. Define Normal distribution and derive it's properties. BT1,PO1,CO4
1. Explain about Student's-t-distribution BT1,PO1,CO5

I B.Sc Statistics/Semester-II**Course 4: THEORETICAL CONTINUOUS DISTRIBUTION (MAJOR PAPER)****Question Bank**

S.N	Short Questions	BT	PO'S	CO'S
1	Define Discrete Uniform Distribution.	BT1	PO2	C01
2	Define Distribution Function of Uniform Distribution	BT3	PO3	C01
3	Define Applications of Uniform Distribution	BT3	PO1	C05
4	Define It's Functions of Uniform Distribution Mgf,Cf&Cgf	BT3	PO2	C05
5	Define Applications of Exponential Distribution	BT2	PO1	C04
6	Define It's Functions of Exponential Distribution Mgf,Cf&Cgf	BT1	PO1	C02
7	Describe Distribution Function of Exponential Distribution.	BT1	PO2	C01
8	Explain Applications of Gamma Distribution	BT2	PO2	C03
9	Explain Functions of Gamma Distribution Mgf,Cf&Cgf	BT2	PO2	C04
10	Explain Application Of Gamma Distribution	BT2	PO3	C03
11	Explain Assumptions of Beta Distribution	BT1	PO2	C03
12	Moments of Gamma Distribution	BT3	PO5	C02
13	Importance of Normal Distribution	BT3	PO3	C03
14	Define Standard Normal distribution.	BT2	PO1	C04
15	Write about the applications of Student T-distribution	BT1	PO3	C05

S.no	Long Questions	BT	PO'S	CO'S
1	Explain the Mean deviation about mean in Uniform distribution	BT1	PO2	C01
2	Define Uniform distribution and derive it's mean and variance.	BT3	PO1	C05
3	Define Exponential distribution and derive it's mean and variance.	BT3	PO3	C01
4	State and prove Memory less property of Exponential distribution.	BT2	PO2	C02
5	Define Gamma distribution and derive it's mean and variance through M.G.F.	BT1	PO3	C05
6	Write about Limiting form of Gamma distribution.	BT3	PO4	C03
7	Discuss briefly about Beta distribution of first kind and derive it's mean and variance.	BT1	PO1	C02
8	Describe briefly about the Beta distribution of second kind and derive it's mean and variance.	BT3	PO4	C03
9	Define Normal distribution and derive it's mean and variance.	BT2	PO2	C03
10	Explain about Importance of Normal distribution.	BT3	PO3	C03
11	Explain Moments of Beta Distribution of first kind	BT2	PO1	C04
12	Explain Application and properties of chi Square distribution	BT2	PO2	C04
13	Describe about Student T-distribution and their properties.	BT2	PO3	C03
14	Explain about the F-distribution and their properties.	BT1	PO2	C03
15	Define chi-square distribution and explain it's properties.	BT3	PO5	C02



GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

Estd: 1853; An Autonomous Institution & Accredited by NAAC at Grade 'A+'

East Godavari District -533 105, Andhra Pradesh, India

(Affiliated to Adikavi Nannayya University, Rajamahendravaram, A.P -533296)



Dr. Ramachandra R K, M.Sc., Ph.D.
PRINCIPAL

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II B.Sc. Statistics (HONOURS)



DEPARTMENT OF STATISTICS


SEMESTER – III & IV

SYLLABUS

MODEL PAPERS & QUESTION BANKS

SEMESTER-III

MAJOR/MINOR	COURSE
II BSC STATISTICS (HONOURS)	
MDC	PRINCIPLES OF MANAGEMENT
LSD	INFORMATION AND COMMUNICATION TECHNOLOGY
MAJOR – 3	M3 :THEORTICAL DISCRETE DISTRIBUTION
MAJOR – 4	M4 : THEORTICAL CONTINUOUS DISTRIBUTION
MAJOR – 5	M5: STATISTICAL METHODS
MAJOR – 6	M6: STATISTICAL INFERENCE
II BSC COMPUTATIONAL MATHEMATICS (HONOURS)	
MINOR – 2	STATISTICAL METHODS

	GOVERNMENT COLLEGE(AUTONOMOUS) RAJAHMUNDRY	Program & Semester II BSC.(III Sem)			
Course Code	TITLE OF THE COURSE MULTI DISCIPLINARY COURSE MDC :PRINCIPLES OF MANAGEMENT				
Teaching	Hours Allocated: 30 (Theory)	L	T	P	C
Pre-requisites:		0	2	0	2

Learning Outcomes:

This course will help the students to develop management skills and identify management functions and understand decision skills and also develop leadership skills.

On Completion of the course, the students will be able to-	
CO1	Understand the concept of management
CO2	Learn key functions of management functions and principles
CO3	Understand organizational behavior and develop decision making skills
CO4	Evaluate leadership skills
Co5	Improve your critical thinking

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – I: Definition of Management, Functions of Management, Principles of Management, Levels of Management, Business Strategy-SWOT Analysis.

Unit – II: Purpose of Planning, Planning Process, Types of Plans, Objectives, Managing by Objectives (MBO); Organizing; Organization Structure, Formal and Informal Organization, Decision Making Process.

Unit-III: Directing, Motivation, Motivation Theories, Leadership Styles, Leadership Theories, Controlling, Process of Controlling, Types of Control-Budgetary and Non-Budgetary, Control Techniques, Cost Control, Purchase Control, Maintenance Control, Quality Control.

Textbooks:


- Philip Kotler, Kevin Lane Keller, Abraham Koshy & Mithileswar Jha, Marketing Management - A South Asian Perspective, Pearson Education.
- Agarwal, P.K., Marketing Management – An Indian perspective, PragatiPrakasham

Suggested Co-Curricular Activities (As far as possible)

- Analyze different needs and wants of consumers in your locality or region
- Prepare the prevalent marketing environment in your locality or region.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	3	2	2	2	2	2	2
CO2	2	3	2	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	2	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	3	2	2	2	1	2	1	2	1	2

	GOVERNMENT COLLEGE(AUTONOMOUS) RAJAHMUNDRY	Program & Semester II BSC.(III Sem)			
Course Code	TITLE OF THE COURSE SKILL COURSE LSD :INFORMATION AND COMMUNICATION TECHNOLOGY				
Teaching	Hours Allocated: 30 (Theory)	L	T	P	C
Pre-requisites:		0	2	0	2

Learning Outcomes:

Course Objective:

This course aims at acquainting the students with basic ICT tools which help them in their day to day and life as well as in office and research.

On Completion of the course, the students will be able to-	
CO1	Understand the literature of social networks and their properties.
CO2	Explain which network is suitable for whom.
CO3	Get acquainted with internet threats and security mechanisms
CO4	Develop skills to use various social networking sites like twitter, flickr, etc
Co5	Apply skills to use online forums, docs, spreadsheets, etc for communication, collaboration and research.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT-I:Fundamentals of Internet: What is Internet?, Internet applications, Internet Addressing – Entering a Web Site Address, URL–Components of URL, Searching the Internet, Browser –Types of Browsers, Introduction to Social Networking: Twitter, Tumblr, LinkedIn, Facebook, flickr, Skype, yahoo, YouTube, WhatsApp .

UNIT-II: E-mail: Definition of E-mail -Advantages and Disadvantages –User Ids, Passwords, Email Addresses, Domain Names, Mailers, Message Components, Message Composition, Mail Management. G-Suite: Google drive, Google documents, Google spread sheets, Google Slides and Google forms.


UNIT-III: Overview of Internet security, E-mail threats and secure E-mail, Viruses and antivirus software, Firewalls, Cryptography, Digital signatures, Copyright issues. What are GOI digital initiatives in higher education? (SWAYAM, SwayamPrabha, National Academic Depository, National Digital Library of India, E-Sodh-Sindhu, Virtual labs, eacharya, e-Yantra and NPTEL).

Textbooks:

1. In-line/On-line : Fundamentals of the Internet and the World Wide Web, 2/e – byRaymond Greenlaw and Ellen Hepp, Publishers : TMH

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	3	2	2	2	2	2	2
CO2	2	3	2	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	2	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	3	2	2	2	1	2	1	2	1	2

	Government College (Autonomous) Rajahmundry				
Course Code 225903	TITLE OF THE COURSE COURSE3: <i>Theoretical Discrete Distributions</i>	Program & Semester II BSC (Sem-III) MAJOR PAPER			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in basic Probability and Random variable concept	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To deal with the data by the basic discrete distributions such as Uniform and Binomial distributions.
2. To acquaint the Poisson distribution applications.
3. To learn about the Negative Binomial distribution and its applications towards the real life problems.
4. To familiar with dealing the data by Geometric and Hyper Geometric distributions.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To deal with the data by the basic discrete distributions such as Uniform and Binomial distributions.
CO2	To acquaint the Poisson distribution applications.
CO3	To learn about the Negative Binomial distribution and its applications towards the real life problems.
CO4	To familiar with dealing the data by Geometric and Hyper Geometric distributions.
Co5	To learn different applications of distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Uniform, Bernoulli and Binomial distributions:

Discrete Uniform distribution – definitions, mean, variance. Bernoulli distribution – definitions, mean, variance and its mgf. Binomial distribution – Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities, limiting case of Binomial Distribution to Normal distribution.

Unit – 2: Poisson Distribution:

Poisson distribution - Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities. Poisson distribution as a limiting case of Binomial distribution, limiting case of Poisson Distribution to Normal distribution.

Unit – 3: Negative Binomial Distribution:

Negative Binomial Distribution - Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, recurrence relation for probabilities. Limiting case of Negative Binomial Distribution to Normal distribution.

Unit – 4: Geometric Distribution :

Geometric Distribution – Definition, moments, M.G.F, C.F, C.G.F, P.G.F, additive property if exists, skewness, kurtosis and problems. First two moments obtained through mgf, Lack of memory property. Recurrence relation for probabilities.

Unit – 5: Hyper Geometric Distribution:

Hyper Geometric Distribution – Definition, mean and variance, problems. Recurrence relation for probabilities. Limiting case of Hyper Geometric distribution to Binomial distribution.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd Web Links

Web Links

- <https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video as tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem-III) MAJOR PAPER			
Course Code 225903P	TITLE OF THE COURSE COURSE3: Theoretical Discrete Distributions				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Probability	0	0	2	1

List of Experiments:

1. Fitting of Binomial distribution – Direct method.
2. Fitting of Binomial distribution – Recurrence relation Method.
3. Fitting of Poisson distribution – Direct method.
4. Fitting of Poisson distribution – Recurrence relation Method.
5. Fitting of Negative Binomial distribution – Direct method.
6. Fitting of Negative Binomial distribution – Recurrence relation Method.
7. Fitting of Geometric distribution – Direct method.
8. Fitting of Geometric distribution – Recurrence relation Method.
9. Fitting of Hyper Geometric distribution

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons
2. O.P. Gupta: Mathematical Statistics, Kedar Nath Ramnath & Co.
3. P.N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol III, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Statistics/Semester-III
COURSE3: Theoretical Discrete Distributions (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

1. Define Bernoulli distribution? BT1,PO2,C01
2. Explain about Binomial distribution? BT2,PO2,C04
3. Define Poisson distribution? BT3,PO5,C02
4. Explain Additive Property Of Geometric Distribution? BT2,PO2,C02
5. Define Geometric distribution? BT3,PO4,C03
6. Discuss about MGF and CF of Binomial Distribution? BT1,PO2,C01
7. ExplainMGF and CGF of Geometric Distribution? BT1,PO2,C05
8. Explain Hypergeometric Distribution BT1,PO2,C03

SECTION-B

Answer any THREE questions

3X10=30M

9. Explain Binomial Distribution and its Additive Property BT1,PO2,C01
10. Fit a Poisson Distribution for the following data BT1,PO2,C02

X	0	1	2	3	4	5	6	7
F	0	4	13	28	42	20	6	2

11. ExplainMean and Variance though mgf of Geometric Distribution BT1,PO2,C03
12. ExplainMoments of Poisson Distribution BT1,PO2,C02
13. Lack of memory property of Geometric Distribution BT1,PO2,C04
14. Explain about HyperGeometricDistribution BT1,PO2,C05


II B.Sc Statistics/Semester-III

Course 3: Theoretical Discrete Distributions MAJOR PAPER

Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Define Bernoulli distribution?	BT1	PO2	C01
2	Explain about Binomial distribution?	BT3	PO3	C01
3	Define Poisson distribution?	BT3	PO1	CO5
4	Describe Mgf,Cf,Cgf&Pgf ofPoisson distribution?	BT3	PO2	CO5
5	Define Geometric distribution?	BT2	PO1	C04
6	Discuss Describe Mgf,Cf,Cgf&Pgf of Binomial Distribution?	BT1	PO1	CO2
7	Explain Assumptions of Poisson distribution?	BT1	PO2	C01
8	Explain Assumptions of Binomial distribution?	BT2	PO2	CO3
9	Describe Mgf,Cf,Cgf&Pgf ofGeometric distribution	BT2	PO2	C04
10	Explain Additive Property ofBinomial Distribution	BT2	PO3	CO3
11	Fit a Binomial Distribution for the following data	BT1	PO2	CO3
12	Explain Additive Property Of PoissonDistribution	BT3	PO5	CO2
13	Explain Poisson distribution as a limiting cases	BT3	PO3	CO3
14	Explain Additive Property of GeometricDistribution	BT2	PO1	C04
15	Explain about HyperGeometricDistribution	BT2	PO2	C04

S.n	Long Questions	BT	PO'S	CO'S																		
1	Define Moments of Binomialdistribution?	BT1	PO2	C01																		
2	Explain Mean and Variance through MGF of Binomial distribution?	BT3	PO1	CO5																		
3	Define Moments of Poisson distribution?	BT3	PO3	C01																		
4	Describe Mean and Variance through MGF of distribution?	BT2	P02	C02																		
5	Define Moments of Geometric distribution?	BT1	PO3	CO5																		
6	Explain Mean and Variance through MGF of Geometricdistribution?	BT3	PO4	CO3																		
7	Fit a Poisson Distribution for the following data <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>F</td> <td>0</td> <td>4</td> <td>13</td> <td>28</td> <td>42</td> <td>20</td> <td>6</td> <td>2</td> </tr> </table>	X	0	1	2	3	4	5	6	7	F	0	4	13	28	42	20	6	2	BT1	PO1	CO2
X	0	1	2	3	4	5	6	7														
F	0	4	13	28	42	20	6	2														
8	Fit a Geometric Distribution for the following data <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>F</td> <td>8</td> <td>7</td> <td>12</td> <td>20</td> <td>32</td> <td>18</td> </tr> </table>	X	1	2	3	4	5	6	F	8	7	12	20	32	18	BT3	PO4	CO3				
X	1	2	3	4	5	6																
F	8	7	12	20	32	18																
9	Define Limiting case of Binomial distribution to Normal distribution	BT2	PO2	CO3																		
10	Define Limiting case of Poisson distribution to Normal distribution	BT3	PO3	CO3																		
11	Binomial Distribution As a limiting case of hyper geometric distribution	BT2	PO1	C04																		
12	ExplainAssumptions and applications of Geometricdistribution	BT2	PO2	C04																		
13	Explain LimitingcaseofNegative Binomial Distribution toNormal distribution?	BT2	PO3	CO3																		
14	Explain Mgf,Cf,Cgf&Pgf ofGeometric distribution	BT1	PO2	CO3																		
15	Explain Lack of memory property of Geometric Distribution	BT3	PO5	CO2																		

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem-III) MAJOR PAPER			
Course Code 225904	TITLE OF THE COURSE COURSE4: <i>Theoretical Continuous Distributions</i>				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Probability and Random variables	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To deal with the data by the basic continuous distribution such as Uniform Binomial distribution.
2. To acquaint the Exponential distribution applications.
3. To learn about the Gamma and Beta distributions and their applications towards the real life problems.
4. To get familiarity of the most important distributions such as Normal and Standard Normal distribution and their applications in research and various fields.
5. To acquire the knowledge of exact sampling distributions

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To deal with the data by the basic continuous distributions such as Uniform Binomial distribution.
CO2	To acquaint the Exponential distribution applications.
CO3	To learn about the Gamma and Beta distributions and their applications towards the real life problems.
CO4	To get familiarity of the most important distributions such as Normal and Standard Normal distribution and their applications in research and various fields.
Co5	To acquire the knowledge of exact sampling distributions.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Continuous Uniform distribution:

Uniform distribution – Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and Distribution function. Mean Deviation about mean.

Unit – 2: Exponential Distribution:

Exponential distribution – Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and Distribution function. Memory less property.

Unit – 3: Gamma and Beta Distributions:

Gamma Distribution - Definition, moments, M.G.F, C.F, C.G.F, skewness, kurtosis and additive property. Limiting form of gamma distribution.

Beta Distribution of first and second kind – Definition, mean, variance and harmonic mean.

Unit – 4: Normal Distribution:

Normal Distribution – Definition, properties, importance, M.G.F, C.F, C.G.F, additive property, skewness, kurtosis and problems. Obtain mean, median and mode, Even and Odd order moments about mean, linear combination of normal variates, points of inflexion of normal probability curve.

Unit – 5: Standard Normal and Sampling Distributions:

Standard Normal Distribution – Definition, mgf, mean and variance, Area property, problems. Concept of Population, Sample, Parameter, Statistic, Sampling Distribution. Student’s t – distribution, F – Distribution, χ^2 – Distribution: Definitions, properties and their applications.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

- 1 O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
- 2 P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd Web Links

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


8. Training of students by related industrial experts
9. Assignments including technical assignments if any.
10. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
11. Preparation of audio and video on tools of diagrammatic and graphical representations.
12. Collection of material/figures/photos/author photos of related topics.
13. Invited lectures and presentations of stalwarts to those topics.
14. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem-III) MAJOR PAPER			
Course Code 225904P	TITLE OF THE COURSE COURSE4: Theoretical Continuous Distributions				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Probability and Random variables	0	0	2	1

List of Experiments:

1. Calculation of moments of Uniform distribution.
2. Calculation of skewness and kurtosis of Uniform distribution.
3. Fitting of Exponential distribution.
4. Gamma distribution application-oriented problems.
5. Fitting of Normal distribution – Areas method.
6. Fitting of Normal distribution – Ordinates method.
7. Problems related to Standard Normal distribution.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O.P. Gupta: Mathematical Statistics, Kedar Nath Ramnath & Co.
3. P.N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Statistics/Semester-III
COURSE4: Theoretical Continuous Distributions (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

1. Write short note on Continuous Random variables BT1,PO1,CO1
2. Explain applications of Uniform Distribution? BT2,PO1,CO5
3. Describe MGF of Exponential distribution. BT3,PO2,CO5
4. Explain Applications of Normal Distribution BT3,PO1,CO2
5. Explain Distribution Function of Exponential Distribution BT1,PO2,CO5
6. Explain Application and properties of t Distribution. BT2,PO2,CO3
7. Explain Applications of Beta Distribution BT3,PO2,CO5
8. Explain about χ^2 -Distribution BT1,PO1,CO5

SECTION-B

Answer any THREE questions


3X10=30M

9. Explain Moments of Rectangular Distribution BT3,PO1,CO1
10. Explain Moments of Exponential Distribution BT2,PO1,CO2
11. Explain It's Functions of Exponential Distribution Mgf,Cf&Cgf BT1,PO1,CO3
12. Describe briefly about the Beta distribution of second kind and derive it's mean and variance.
13. Lack of memory property of Exponential distribution BT3,PO1,CO3
14. Define Normal distribution and derive it's properties. BT1,PO1,CO4
15. Explain about Student's t-distribution BT1,PO1,CO5

II B.Sc Statistics/Semester-III
Course 4: Theoretical continuous distribution (MAJOR PAPER)
Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Define Discrete Uniform Distribution.	BT1	PO2	C01
2	Define Distribution Function of Uniform Distribution	BT3	PO3	C01
3	Define Applications of Uniform Distribution	BT3	PO1	C05
4	Define It's Functions of Uniform Distribution Mgf,Cf&Cgf	BT3	PO2	C05
5	Define Applications of Exponential Distribution	BT2	PO1	C04
6	Define It's Functions of Exponential Distribution Mgf,Cf&Cgf	BT1	PO1	C02
7	Describe Distribution Function of Exponential Distribution.	BT1	PO2	C01
8	Explain Applications of Gamma Distribution	BT2	PO2	C03
9	Explain Functions of Gamma Distribution Mgf,Cf&Cgf	BT2	PO2	C04
10	Explain Application Of Gamma Distribution	BT2	PO3	C03
11	Explain Assumptions of Beta Distribution	BT1	PO2	C03
12	Moments of Gamma Distribution	BT3	PO5	C02
13	Importance of Normal Distribution	BT3	PO3	C03
14	Define Standard Normal distribution.	BT2	PO1	C04
15	Write about the applications of Student T-distribution	BT1	PO3	C05

S.no	Long Questions	BT	PO'S	CO'S
1	Explain the Mean deviation about mean in Uniform distribution	BT1	PO2	C01
2	Define Uniform distribution and derive it's mean and variance.	BT3	PO1	C05
3	Define Exponential distribution and derive it's mean and variance.	BT3	PO3	C01
4	State and prove Memory less property of Exponential distribution.	BT2	PO2	C02
5	Define Gamma distribution and derive it's mean and variance through M.G.F.	BT1	PO3	C05
6	Write about Limiting form of Gamma distribution.	BT3	PO4	C03
7	Discuss briefly about Beta distribution of first kind and derive it's mean and variance.	BT1	PO1	C02
8	Describe briefly about the Beta distribution of second kind and derive it's mean and variance.	BT3	PO4	C03
9	Define Normal distribution and derive it's mean and variance.	BT2	PO2	C03
10	Explain about Importance of Normal distribution.	BT3	PO3	C03
11	Explain Moments of Beta Distribution of first kind	BT2	PO1	C04
12	Explain Application and properties of chi Square distribution	BT2	PO2	C04
13	Describe about Student T-distribution and their properties.	BT2	PO3	C03
14	Explain about the F-distribution and their properties.	BT1	PO2	C03
15	Define chi-square distribution and explain it's properties.	BT3	PO5	C02

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem - III) MAJOR PAPER			
Course Code 225905	TITLE OF THE COURSE COURSE5: STATISTICAL METHODS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To get the knowledge of estimating future values by using curve fitting.
2. To calculate the relationship between bivariate data.
3. To find the relationship about the multivariate data.
4. To acquaint about the forecasting of the data by using regression techniques.
5. To find the association of the categorical data by using attributes.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To get the knowledge of estimating future values by using curve fitting.
CO2	To calculate the relationship between bivariate data.
CO3	To find the relationship about the multivariate data.
CO4	To acquaint about the forecasting of the data by using regression techniques.
CO5	To find the association of the categorical data by using attributes.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Curve fitting:

Bivariate data, Principle of least squares, fitting of k^{th} degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, fitting of family of exponential curves and power curve.

Unit– 2: Correlation:

Meaning, Types of Correlation, Measures of Correlation – Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Properties. Bivariate frequency distribution, correlation coefficient for bivariate data and problems. Lag and Lead in correlation.

Unit–3: Concept of multiple and partial correlation:

Concept of multiple and partial correlation coefficients (three variables only), properties and problems, intra-class correlation and correlation ratio.

Unit–4:Regression:

Concept of Regression, Linear and Non Linear regression. Linear Regression–Regression lines, Regression coefficients and its properties, Angle between two lines of regression. Regression lines for bivariate data and simple problems. Correlation vs regression. Explained and Unexplained variations.

Unit–5:Attributes:

Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only, Independence of attributes, Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency, Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
 2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd
- Web Links

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem - III) MAJOR PAPER			
Course Code 225905P	TITLE OF THE COURSE COURSE5: STATISTICAL METHODS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Fitting of straight line by the method of least squares.
2. Fitting of parabola by the method of least squares.
3. Fitting of exponential curve of two types by the method of least squares.
4. Fitting of power curve of the type by the method of least squares.
5. Computation of correlation coefficient and regression lines for ungrouped data.
6. Computation of correlation coefficient for bivariate frequency distribution.
7. Computation of correlation coefficient, forming regression lines for grouped data.
8. Computation of partial and multiple correlation coefficients.
9. Computation of Yule's coefficient of association and colligation.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd .

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Statistics/Semester-III
COURSE 5: STATISTICAL METHODS (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X 4 = 20M

1. Define Correlation and types of correlation. BT2,PO2,CO1
2. Explain about tied ranks BT2,PO2,CO5
3. Define Regression and its types BT1,PO2,CO3
4. Explain about principal of Least Squares. BT3,PO3,CO1
5. Explain about Fitting of Exponential Curve BT3,PO3,CO2
6. Describe about Consistency of data. BT3,PO3,CO2
7. Define Association of attributes BT1,PO2,CO3
8. Describe Order of class frequencies. BT1,PO3,CO5

SECTION-B

Answer any THREE questions

3X10=30M

9. Explain Derive Spearman's Rank correlation coefficient. BT3,P03,CO1
10. Fit a Straight line of the form to the following data BT3,PO2,C01

X	2	4	6	8	10	12
Y	10	14	19	25	31	36

11. Explain Regression lines X on Y BT3,P02,CO1
12. Compute Correlation Coefficient for the following data BT3,PO2,C01

X	20	14	36	29	5	11
Y	19	9	25	10	2	6


13. Explain about Partial and Multiple Correlations BT3,PO3,C03
14. Explain about Consistency of Data? BT3,PO2,C01

II B.Sc Statistics/Semester-III
Statistics Course - 5: STATISTICAL METHODS (MAJOR PAPER)

Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Define Curve Fitting.	BT1	PO2	C01
2	Define Power Curve.	BT2	PO1	C04
3	Explain about principal of Least Squares.	BT3	PO3	C01
4	Define Correlation and types of correlation.	BT2	P02	C02
5	Explain about Karl Pearson's Coefficient of Correlation.	BT1	PO1	CO2
6	Define Rank Correlation.	BT3	PO4	CO3
7	Elaborate Scatter diagram.	BT2	PO1	C04
8	Explain about Bi-variate frequency distribution.	BT2	PO2	CO3
9	Define Correlation Ratio.	BT2	PO3	CO3
10	Define Regression.	BT1	PO3	CO5
11	Write about types of Regression.	BT1	PO2	CO3
12	Explain about Regression lines.	BT3	PO5	CO2
13	Define Attributes.	BT3	PO3	CO3
14	Explain about Order of class frequencies.	BT2	PO1	C04
15	Describe about Consistency of data.	BT2	PO2	C04

S.NO	Long Questions	BT	PO'S	CO'S
1	Explain about Fitting of second-degree parabola.	BT3	PO3	C01
2	Explain about Fitting of Power curve.	BT2	P02	C02
3	Explain about Fitting of straight line.	BT1	PO1	CO2
4	Define Correlation and explain it's properties.	BT1	PO2	C01
5	Explain about measures of correlation.	BT2	P02	C02
6	Derive Spearman's Rank correlation coefficient.	BT3	PO4	CO3
7	Explain about Multiple and Partial correlation coefficient.	BT3	PO3	CO3
8	Describe Define Association of attributes	BT1	PO2	CO3
9	Explain about Regression and explain it's properties.	BT2	PO2	CO3
10	Distinguish between Correlation vs Regression.	BT3	PO4	CO3
11	Analyze briefly about explained and unexplained variations in Regression.	BT2	PO3	CO3
12	Prove that angle between two lines of regression.	BT1	PO3	CO5
13	Describe about the relationship between Association and Colligation of Attributes.	BT3	PO5	CO2
14	Explain briefly about contingency table: Square, Mean square contingency.	BT2	PO1	C04
15	Show that for n attributes $A_1 < A_2 < \dots < A_n$.	BT1	PO3	CO5

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem - III) MAJOR PAPER			
Course Code 225906	TITLE OF THE COURSE COURSE 6: STATISTICAL INFERENCE				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To acquaint with estimator, estimates, estimation techniques and its properties.
2. To acquire knowledge of testing the hypothesis of different distributions.
3. To learn about the large sample techniques by using various tools.
4. To learn about the small sample techniques by using various tools.
5. To deal with the situation where there are no parameters to the distributions..

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	□ □ To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit- 1: Theory of estimation:

Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Rao – Cramer Inequality, properties. Binomial, Poisson & Normal Population parameters estimate by MLE method. Confidence Intervals.

Unit-2: Testing of Hypothesis:

Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

Unit -3: Large sample Tests:

Large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions. standard deviation(s) and correlation coefficient(s).

Unit-4: Small Sample tests:

Assumptions and t-test for single mean, difference of means and paired t-test. χ^2 test for goodness of fit and independence of attributes. F -test for equality of variances.

Unit-5: Non-parametric tests:

Advantages and disadvantages, comparison with parametric tests. One sample runs test, sign test and Wilcoxon – signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon – Mann – Whitney U test, Wald Wolfowitz's runs test.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem - III) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 6: STATISTICAL INFERENCE				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Large sample test for mean and difference of means.
2. Large sample test for proportion and difference of proportions.
3. Large sample test for standard deviation and difference of standard deviations.
4. Large sample test for correlation coefficient.
5. Small sample test for mean and difference of means.
6. Small sample test for correlation coefficient.
7. Paired t - test (paired samples).
8. Small sample test for single variance (χ^2 test) and difference of variances (F test).
9. χ^2 test for goodness of fit and independence of attributes.
10. Non parametric tests for single sample (run test, sign test and Wilcoxon signed rank test).
11. Non parametric tests for related samples (sign test and Wilcoxon signed rank test).
12. Non parametric tests for two independent samples (Median test, Wilcoxon –Mann – Whitney – U test, Wald–Wolfowitz’s runs test).

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts on those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd. Virtual Lab Links:

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Statistics/Semester-III
COURSE 6: STATISTICAL INFERENCE (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any Five questions.

5 X 4 =20M

- | | |
|---|-------------|
| 1. Explain short note on Estimation? | BT3,PO3,CO1 |
| 2. Explain about Confidence Intervals? | BT2,PO2,CO2 |
| 3. Define null and alternative hypothesis? | BT1,PO2,CO2 |
| 4. Explain types of errors? | BT1,PO3,CO5 |
| 5. Explain single proportion? | BT1,PO2,CO3 |
| 6. Explain F-test for equality of variances | BT1,PO3,CO5 |
| 7. What are Non parametric tests and its assumptions? | BT3,PO1,CO5 |
| 8. Explain Sign test? | BT3,PO1,CO5 |

SECTION-B

Answer any THREE questions

3X10=30M


- | | |
|---|-------------|
| 9. Explain criteria of a good estimator | BT3,PO3,CO1 |
| 10. Explain MLE | BT2,PO2,CO5 |
| 11. State and Prove NP-Lemma | BT1,PO2,CO2 |
| 12. Explain Single and two means concept in Large Samples | BT1,PO2,CO5 |
| 13. Explain about Chi-square test goodness of fit | BT1,PO2,CO3 |
| 14. Explain Non parametric test vs parametric test | BT1,PO3,CO5 |

II B.Sc Statistics/Semester-III
Course 6: Inferential Statistics (MAJOR PAPER)

Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Explain about the consistency and efficiency.	BT1	PO2	C01
2	Describe about confidence intervals.	BT3	PO3	C01
3	Define Null and Alternative hypothesis.	BT3	PO3	CO3
4	Explain about level of significance.	BT2	PO2	C02
5	Write about two types of errors.	BT1	PO3	CO5
6	Explain about Statistical hypothesis.	BT1	PO1	CO2
7	Explain about large sample test for Single mean	BT3	PO4	CO3
8	Explain about large sample test for Single Proportion.	BT3	PO5	CO2
9	Explain about large sample test for correlation coefficients.	BT3	PO3	CO3
10	Describe about chi-square - test for single variance.	BT2	PO1	C04
11	Define Small sample test and write it's assumptions.	BT2	PO2	C04
12	Explain about t-test for Single mean	BT1	PO2	CO3
13	Describe about paired t-test.	BT3	PO4	CO3
14	Write about Advantages and Disadvantages of Non-parametric tests	BT2	PO2	CO3
15	Describe about the Wald Wolfowitz's runs test.	BT2	PO3	CO3

Sno	Long Questions	BT	PO'S	CO'S
1	Describe about the criteria of a good estimator.	BT1	PO2	C01
2	Define MLE's and explain about properties of MLE's.	BT3	PO3	C01
3	Explain Two tailed test and one tailed test	BT1	PO3	CO5
4	Explain about Normal population parameters by MLE Method.	BT3	PO1	CO5
5	State and prove Neyman's Pearson's Lemma.	BT3	PO2	CO5
6	Define (i) Critical Region(ii) most powerful test (iii) power of a test.	BT1	PO2	CO3
7	Explain about test for differences of two means.	BT1	PO1	CO2
8	Explain about test for differences of Proportions.	BT3	PO4	CO3
9	Explain about large sample test for standard deviation.	BT1	PO1	CO2
10	Illustrate about chi-square test for goodness of fit.	BT2	PO2	CO3
11	Discuss about Independence of attributes in chi-square distribution.	BT2	PO3	CO3
12	Describe about F-test for equality of variances.	BT1	PO2	CO3
13	Explain Median test.	BT3	PO4	CO3
14	Explain Sign test.			
15	Distinguish between the parametric tests vs non-parametric tests?	BT4	PO5	CO4

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem - III) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE5:STATISTICALMETHODS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To get the knowledge of estimating future values by using curve fitting.
2. To calculate the relationship between bivariate data.
3. To find the relationship about the multivariate data.
4. To acquaint about the forecasting of the data by using regression techniques.
5. To find the association of the categorical data by using attributes.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To get the knowledge of estimating future values by using curve fitting.
CO2	To calculate the relationship between bivariate data.
CO3	To find the relationship about the multivariate data.
CO4	To acquaint about the forecasting of the data by using regression techniques.
CO5	To find the association of the categorical data by using attributes

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Curve fitting:

Bivariate data, Principle of least squares, fitting of k^{th} degree polynomial. Fitting of straight line, Fitting of Second degree polynomial or parabola, fitting of family of exponential curves and power curve.

Unit– 2: Correlation:

Meaning, Types of Correlation, Measures of Correlation – Scatter diagram, Karl Pearson's Coefficient of Correlation, Rank Correlation Coefficient (with and without ties), Properties. Bivariate frequency distribution, correlation coefficient for bivariate data and problems. Lag and Lead in correlation.

Unit–3: Concept of multiple and partial correlation:

Concept of multiple and partial correlation coefficients (three variables only), properties and problems, intra-class correlation and correlation ratio.

Unit–4:Regression:

Concept of Regression, Linear and Non Linear regression. Linear Regression–Regression lines, Regression coefficients and its properties, Angle between two lines of regression. Regression lines for bivariate data and simple problems. Correlation vs regression. Explained and Unexplained variations.

Unit–5:Attributes:

Notations, Class, Order of class frequencies, Ultimate class frequencies, Consistency of data, Conditions for consistency of data for 2 and 3 attributes only, Independence of attributes, Association of attributes and its measures, Relationship between association and colligation of attributes, Contingency table: Square contingency, Mean square contingency, Coefficient of mean square contingency, Tschuprow's coefficient of contingency

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

3. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
 4. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd
- Web Links

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


8. Training of students by related industrial experts
9. Assignments including technical assignments if any.
10. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
11. Preparation of audio and video on tools of diagrammatic and graphical representations.
12. Collection of material/figures/photos/author photos of related topics.
13. Invited lectures and presentations of stalwarts to those topics.
14. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC (Sem - III) MINOR PAPER			
Course Code 225905P	TITLE OF THE COURSE COURSE5: STATISTICALMETHODS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Fitting of straight line by the method of least squares.
2. Fitting of parabola by the method of least squares.
3. Fitting of exponential curve of two types by the method of least squares.
4. Fitting of power curve of the type by the method of least squares.
5. Computation of correlation coefficient and regression lines for ungrouped data.
6. Computation of correlation coefficient for bivariate frequency distribution.
7. Computation of correlation coefficient, forming regression lines for grouped data.
8. Computation of partial and multiple correlation coefficients.
9. Computation of Yule's coefficient of association and colligation.

Suggested Co-curricular Activities:

8. Training of students by related industrial experts
9. Assignments including technical assignments if any.
10. Seminars, Group Discussions, Quiz, Debates on related topics.
11. Preparation of audio and video on tools of diagrammatic and graphical representations.
12. Collection of material/figures/photos/author photos of related topics.
13. Invited lectures and presentations of stalwarts on those topics.
14. Visits/field trips of firms, research organizations etc.

Reference books:

3. O. P. Gupta: Mathematical Statistics, Kedar Nath Ram Nath & Co.
4. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd .

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Computational Mathematics /Semester-III
COURSE 5: STATISTICALMETHODS (MINOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

9. Define Correlation and types of correlation. BT2,PO2,CO1
10. Explain about tied ranks BT2,PO2,CO5
11. Define Regression and its types BT1,PO2,CO3
12. Explain about principal of Least Squares. BT3,PO3,CO1
13. Explain about Fitting of Exponential Curve BT3,PO3,CO2
14. Describe about Consistency of data. BT3,PO3,CO2
15. Define Association of attributes BT1,PO2,CO3
16. Describe Order of class frequencies. BT1,PO3,CO5

SECTION-B

Answer any THREE questions

3X10=30M

9. Explain Derive Spearman's Rank correlation coefficient. BT3,P03,CO1

10. Fit a Straight line of the form to the following data BT3,PO2,C01

X	2	4	6	8	10	12
Y	10	14	19	25	31	36

11. Explain Regression lines X on Y BT3,P02,CO1

12. Compute Correlation Coefficient for the following data BT3,PO2,C01

X	20	14	36	29	5	11
Y	19	9	25	10	2	6

13. Explain about Partial and Multiple Correlations BT3,PO3,C03

14. Explain about Consistency of Data? BT3,PO2,C01

II B.Sc Computational Mathematics /Semester-III
Course - 5: STATISTICAL METHODS (MINOR PAPER)


Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Define Curve Fitting.	BT1	PO2	C01
2	Define Power Curve.	BT2	PO1	C04
3	Explain about principal of Least Squares.	BT3	PO3	C01
4	Define Correlation and types of correlation.	BT2	P02	C02
5	Explain about Karl Pearson's Coefficient of Correlation.	BT1	PO1	CO2
6	Define Rank Correlation.	BT3	PO4	CO3
7	Elaborate Scatter diagram.	BT2	PO1	C04
8	Explain about Bi-variate frequency distribution.	BT2	PO2	CO3
9	Define Correlation Ratio.	BT2	PO3	CO3
10	Define Regression.	BT1	PO3	CO5
11	Write about types of Regression.	BT1	PO2	CO3
12	Explain about Regression lines.	BT3	PO5	CO2
13	Define Attributes.	BT3	PO3	CO3
14	Explain about Order of class frequencies.	BT2	PO1	C04
15	Describe about Consistency of data.	BT2	PO2	C04

S.NO	Long Questions	BT	PO'S	CO'S
1	Explain about Fitting of second-degree parabola.	BT3	PO3	C01
2	Explain about Fitting of Power curve.	BT2	P02	C02
3	Explain about Fitting of straight line.	BT1	PO1	CO2
4	Define Correlation and explain it's properties.	BT1	PO2	C01
5	Explain about measures of correlation.	BT2	P02	C02
6	Derive Spearman's Rank correlation coefficient.	BT3	PO4	CO3
7	Explain about Multiple and Partial correlation coefficient.	BT3	PO3	CO3
8	Describe Define Association of attributes	BT1	PO2	CO3
9	Explain about Regression and explain it's properties.	BT2	PO2	CO3
10	Distinguish between Correlation vs Regression.	BT3	PO4	CO3
11	Analyze briefly about explained and unexplained variations in Regression.	BT2	PO3	CO3
12	Prove that angle between two lines of regression.	BT1	PO3	CO5
13	Describe about the relationship between Association and Colligation of Attributes.	BT3	PO5	CO2
14	Explain briefly about contingency table: Square, Mean square contingency.	BT2	PO1	C04
15	Show that for n attributes $A_1 < A_2 < \dots < A_n$.	BT1	PO3	CO5

SEMESTER-IV

MAJOR/MINOR	COURSE
II BSC STATISTICS (HONOURS)	
SKILL	INDIAN PHILOSOPHY / FUNDAMENTALS OF ECONOMICS
SKILL	CYBER SECURITY
MAJOR – 7	M7: THEORY OF SAMPLING
MAJOR – 8	M8: DESIGN OF EXPERIMENTS
MAJOR – 9	M9: NUMERICAL ANALYSIS
II BSC COMPUTATIONAL MATHEMATICS (HONOURS)	
MINOR – 3	THEORY OF SAMPLING
MINOR – 4	DESIGN OF EXPERIMENTS

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 7: THEORY OF SAMPLING				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To review about the population and its concepts also methods to collect data and errors to deal.
2. Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
3. An idea of conducting the sample surveys and selecting appropriate sampling techniques.
4. Knowledge about comparing various sampling techniques.
5. To use appropriate factorial experimental to analyze the experimental data.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To review about the population and its concepts also methods to collect data and errors to deal.
CO2	Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
CO3	An idea of conducting the sample surveys and selecting appropriate sampling techniques.
CO4	Knowledge about comparing various sampling techniques.
CO5	To use appropriate factorial experimental to analyze the experimental data.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Introduction to Sampling :

Brief review of parameter and statistic, sampling distribution. Principal steps and principles in a sample survey, sampling and non – sampling errors, advantages of sampling over census, limitations, types of sampling – concept of subjective, probability and mixed sampling.

Unit-2: Simple Random Sampling (with and without replacement):

Notations and terminology, various probabilities of selection. Random numbers tables and its uses. Methods of selecting simple random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors, determination of sample size, simple and sampling of attributes.

Unit -3: Stratified random sampling:

Stratified random sampling, Advantages and Disadvantages of Stratified Random sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.

Unit-4: Systematic sampling:

Systematic sampling definition when $N = nk$ and merits and demerits of systematic sampling - estimate of mean and its variance. Comparison of systematic sampling with Stratified and SRSWOR. Comparison of variance of SRS, StRS and SYS for a linear trend. Concept of Cluster Sampling, Multistage Sampling and Quota Sampling.

Unit-5: National and International Official Statistical System:

National Statistical Organization: vision and mission, NSSO and CSO, roles and responsibilities, important activities, publications etc. National Statistical Commission: Need, Constitution, its role, functions, important acts

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar Nath Ram Nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd Web Link

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 7: THEORY OF SAMPLING				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Survey and Statistical tools	0	0	2	1

List of Experiments:

1. Show the sample mean is unbiased estimator of population mean in SRSWOR and also find variance of sample mean.
2. Show the sample mean square is unbiased estimator of population mean square in SRSWOR.
3. Show the sample mean is unbiased estimator of population mean in SRSWR and also find variance of sample mean.
4. Compare means and variances between SRSWR and SRSWOR.
5. Allocation of sample sizes to various strata in proportional and in optimum allocations to draw a Stratified random sample.
6. Compare precision in proportional and optimum allocations with SRSWOR and gain in efficiency due to proportional and optimum allocations.
7. Systematic sampling with $N=nk$ and compare the precision of an estimate in systematic sampling with that of in Stratified and in SRSWOR.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath& Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company LtdWeb Links

Virtual Lab Link

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Statistics/Semester-IV
COURSE 7: THEORY OF SAMPLING (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

- | | |
|--|-------------|
| 1. Explain short note on types of Sampling. | BT1,PO1,CO2 |
| 2. Explain about Sampling Errors and Non-sampling errors | BT3,PO3,CO2 |
| 3. Explain SRSWR vs SRSWOR | BT2,PO1,CO2 |
| 4. Explain allocations in Stratified Sampling | BT2,PO2,CO5 |
| 5. Explain Random numbers method | BT3,PO3,CO2 |
| 6. Explain Systematic Sampling | BT3,PO3,CO1 |
| 7. Explain NSSO | BT3,PO3,CO5 |
| 8. Explain National Statistical Commission | BT2,PO1,CO2 |

SECTION-B

Answer any THREE questions

3X10=30M

- | | |
|---|-------------|
| 9. Explain principal steps in sample survey.
(OR) | BT2,PO2,CO5 |
| 10. Show that $E(s^2)=S^2$ in SRSWOR. | BT2,PO2,CO3 |
| 11. Comparison of variance of SRS, StRS and SYS for a linear trend
(OR) | BT4,PO5,CO4 |
| 12. Show that $V(\bar{y}_{opt}) \leq V(\bar{y}_{prop}) \leq V(\bar{y}_{srswor})$ | BT2,PO2,CO3 |
| 13. Define Systematic sampling and write it's advantages and disadvantages.
(OR) | BT1,PO2,CO3 |
| 14. Explain the roles and responsibilities of C.S.O | BT2,PO2,CO2 |


II B.Sc Statistics/Semester-IV

Statistics Course-7: **THEORY OF SAMPLING**(MAJOR PAPER)

Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Write the difference between sampling versus census.	BT1	PO2	C01
2	Explain about limitations of sampling.	BT1	PO2	CO3
3	Define (i)parameter (ii) statistic (iii) Sampling distribution.	BT3	PO5	CO2
4	Define simple random sampling	BT3	PO3	CO3
5	Illustrate the types of SRS.	BT2	PO1	C04
6	Explain about Random number method.	BT2	PO2	C04
7	Explain about Lottery method.	BT1	PO3	CO5
8	Describe about Determination of sample size.	BT3	PO1	CO5
9	Write about advantages and disadvantages of stratified random sampling.	BT1	PO2	CO3
10	Explain stratified random sampling.	BT3	PO5	CO2
11	Define Proportional and Optimum allocation.	BT3	PO3	CO3
12	Write about Merits and Demerits of systematic sampling.	BT2	PO1	C04
13	Explain about Systematic Sampling.	BT2	PO2	C04
14	Explain the concept of Cluster sampling	BT1	PO3	CO5
15	Define NSSO and CSO.	BT3	PO1	CO5

S.NO	Long Questions	BT	PO'S	CO'S
1	Explain principal steps in sample survey.	BT2	PO2	CO3
2	Explain about types of sampling.	BT2	PO3	CO3
3	Describe about sampling and non sampling errors.	BT1	PO2	CO3
4	Distinguish between SRSWR and SRSWOR.	BT3	PO4	CO3
5	Show that $E(s^2)=S^2$ in SRSWOR.	BT4	PO5	CO4
6	Show that sample mean is unbiased estimator of population mean in SRSWOR.	BT3	PO3	CO3
7	Explain stratified random sampling with proportional and optimum allocation.	BT2	PO2	CO3
8	Show that sample mean is unbiased estimator of population mean in Stratified random sampling.	BT2	PO3	CO3
9	Define stratified random sampling and write about mean and variance.	BT1	PO2	CO3
10	Show that $V(\bar{y}_{opt}) \leq V(\bar{y}_{prop}) \leq V(\bar{y}_{srswor})$	BT3	PO4	CO3
11	Define Systematic sampling and write it's advantages and disadvantages.	BT4	PO5	CO4
12	Explain the comparison of systematic sampling with Stratified and SRSWOR.	BT3	PO3	CO3
13	Describe the concept of when $N=nk$ in systematic sampling.	BT2	PO1	C04
14	Explain the functions of N.S.C	BT2	PO2	C04
15	Explain the roles and responsibilities of N.S.O	BT1	PO2	C01

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 8:DESIGN AND ANALYSIS OF EXPERIMENTS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To acquaint with the role of statistics in different fields with special reference to agriculture.
2. Learn to apply the one of the designs of experiment to agricultural fields.
3. Learn to apply the randomization to the blocks of various fields in agriculture.
4. To get the familiarity about applications of three principles.
5. Learn to deal the agricultural fields with different factors and levels.
6. To use appropriate experimental designs to analyze the experimental data. Outcomes:

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the role of statistics in different fields with special reference to agriculture.
CO2	Learn to apply the one of the design of experiment to agricultural fields.
CO3	Learn to apply the randomization to the blocks of various fields in agriculture.
CO4	To get the familiarity about applications of three principles.
Co5	Learn to deal the agricultural fields with different factors and levels.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Analysis of variance (ANOVA):

Concept, Definition and assumptions. ANOVA one way classification – mathematical model, analysis – with equal and unequal classification. ANOVA two way classification – mathematical model, analysis and problems.

Unit-2: Completely Randomised Design (CRD):

Definition, terminology, Principles of design of experiments, CRD – Concept, advantages and disadvantages, applications, Layout, Statistical analysis. Critical Differences when hypothesis is significant.

Unit-3: Randomised Block Design (RBD):

Concept, advantages and disadvantages, applications, Layout, Statistical analysis and Critical Differences. Efficiency of RBD relative to CRD. RBD with one missing value and its analysis, problems.

Unit-4: Latin Square Design:

Concept, advantages and disadvantages, applications, Layout, Statistical analysis and Critical Differences. Efficiency of LSD over RBD and CRD. Estimation of one missing value in LSD and its analysis, problems.

Unit-5: Factorial experiments:

Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals

Textbooks:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
3. M.R. Saluja: Indian Official Statistics. ISI publications.

Reference books:

4. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
5. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
6. M.R. Saluja: Indian Official Statistics. ISI publications.

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 8: DESIGN AND ANALYSIS OF EXPERIMENTS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Survey and Statistical tools	0	0	2	1

List of Experiments:

1. ANOVA – one way classification with equal number of observations.
2. ANOVA – one way classification with unequal number of observations.
3. ANOVA – Two way classification.
4. Analysis of CRD and critical differences.
5. Analysis of RBD and critical differences. Relative efficiency of CRD with RBD.
6. Estimation of single missing observation in RBD and its analysis.
7. Analysis of LSD and efficiency of LSD over CRD and RBD.
8. Estimation of single missing observation in LSD and its analysis.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts on those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
3. M.R. Saluja: Indian Official Statistics. ISI publications.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26

II B.Sc Statistics/Semester-IV

COURSE 8: DESIGN AND ANALYSIS OF EXPERIMENTS (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

- | | |
|--|-------------|
| 1. Write about assumptions of ANOVA. | BT1,PO3,CO2 |
| 2. Write Short note on ANOVA | BT1,PO3,CO1 |
| 3. Define completely randomized design (CRD) | BT2,PO3,CO1 |
| 4. Explain about fixed effect & random effect model. | BT3,PO2,CO4 |
| 5. Describe about applications for RBD. | BT1,PO3,CO5 |
| 6. Write about advantages and disadvantages of LSD. | BT2,PO3,CO3 |
| 7. Compare the Efficiencies of RBD over LSD | BT3,PO3,CO3 |
| 8. Describe Yates procedure to find factorial effect totals. | BT1,PO2,CO4 |

SECTION-B

Answer any THREE questions

3X10=30M

- | | |
|--|-------------|
| 9. Explain ANOVA two way classification | BT1,PO3,CO5 |
| 10. One way Classification Model Problem | BT3,PO2,CO4 |
- Four Varieties of Fertilizers have been applied to Five plots each. the yield given below

Varieties	Plots				
	I	II	III	IV	V
1	1.9	2.2	2.6	1.8	2.1
2	2.5	1.9	2.3	2.6	2.2
3	1.7	1.9	2.2	2.0	2.1
4	2.1	1.8	2.5	2.3	2.4

- | | |
|---|-------------|
| 11. Explain about CRD | BT2,PO2,CO3 |
| 12. Explain missing plot technique is RBD | BT2,PO2,CO3 |
| 13. Explain about LSD | BT2,PO1,CO1 |
| 14. Explain 2^3 factorial experiments | BT1,PO1,CO1 |


II B.Sc Statistics/Semester-IV

Course – 8: DESIGN AND ANALYSIS OF EXPERIMENTS (MAJOR PAPER)

Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Write about assumptions of ANOVA.	BT1	PO2	CO1
2	Write Short note on ANOVA	BT1	PO2	CO3
3	Define completely randomized design (CRD)	BT3	PO5	CO2
4	Explain about fixed effect & random effect model.	BT3	PO3	CO3
5	Describe about applications for RBD.	BT2	PO1	CO4
6	Write about advantages and disadvantages of LSD.	BT2	PO2	CO4
7	Describe Yates procedure to find factorial effect totals.	BT1	PO3	CO5
8	Compare the Efficiencies of RBD over LSD	BT3	PO1	CO5
9	Main effects and interaction effects	BT1	PO2	CO3
10	Two way classification	BT3	PO5	CO2
11	Estimation of one missing value in LSD	BT3	PO3	CO3
12	Explain 2^3 factorial experiments	BT2	PO1	CO4
13	Explain 2^2 factorial experiments	BT2	PO2	CO4
14	Fertilizers have been applied to Five plots each.	BT1	PO3	CO5
15	Layout of LSD	BT3	PO1	CO5

S.NO	Long Questions	BT	PO'S	CO'S
1	Explain ANOVA one way classification	BT2	PO2	CO3
2	One way Classification Model Problem	BT2	PO3	CO3
3	Four Varieties of Fertilizers have been applied to Five plots each. the yield given below	BT1	PO2	CO3
4	Explain about CRD	BT3	PO4	CO3
5	Explain missing plot technique in RBD	BT4	PO5	CO4
6	Explain about LSD	BT3	PO3	CO3
7	Explain 2^n factorial experiments	BT2	PO2	CO3
8	Explain ANOVA two way classification	BT2	PO3	CO3
9	Explain missing plot technique in RBD	BT1	PO2	CO3
10	Four Varieties of Fertilizers have been applied to Five plots each. the yield given below	BT3	PO4	CO3
11	Efficiency of RBD relative to CRD	BT4	PO5	CO4
12	Write Short note on ANOVA	BT3	PO3	CO3
13	Define completely randomized design (CRD)	BT2	PO1	CO4
14	Explain about fixed effect & random effect model.	BT2	PO2	CO4
15	Describe about applications for RBD.	BT1	PO2	CO1

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) (MAJOR PAPER)			
Course Code	TITLE OF THE COURSE COURSE 9: NUMERICAL ANALYSIS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

The objective of this course is to different methods and strategies used to select a representative sample from a large population. It aims to provide researchers with guidance on how to obtain accurate and reliable results by choosing appropriate sampling techniques

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To review about the population and its concepts also methods to collect data and errors to deal.
CO2	Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
CO3	An idea of conducting the sample surveys and selecting appropriate sampling techniques.
CO4	Knowledge about comparing various sampling techniques.
Co5	To use appropriate factorial experimental to analyze the experimental data.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Definitions of Forward difference:

Definitions of Forward difference operator (Δ), Backward difference operator, Shift or Extension (displacement) operator (E), Central Differences operator (μ), Differentiation operator (D), Mean value operator Symbolic relations between operators, properties of difference and shift operators, fundamental theorem on finite differences and simple problems.

Unit-2: Interpolation with equal intervals:

Interpolation with equal intervals: Concept of interpolation and extrapolation, assumptions and uses of interpolation, difference tables, methods of interpolation with equal intervals - Newton's formula for forward and backward interpolation, Central differences, Gauss forward and backward, Sterling, Bessel's and Laplace - Everett's Formulae.

Unit -3: Interpolation with unequal intervals:

Interpolation with unequal intervals: Divided differences and their properties. Methods of interpolation with unequal intervals - Newton's Divided difference formula and Lagrange's formula. Inverse interpolation - Lagrange's formula.

Unit-4:Numerical Differentiation :

Numerical Differentiation: Introduction to Numerical differentiation. Determination of First and Second order derivatives for the given data using Newton's forward and backward, Gauss forward and backward, Sterling, Bessel's and Newton's Divided difference formula.

Unit-5:Numerical Integration :

Numerical Integration: Introduction to numerical integration, General Quadrature formula for equidistant ordinates, Trapezoidal rule, Simpson's 1/3 rd ,Simpson's 3/8 th rule and Weddle's rule

Textbooks:

S.C. Gupta&V.K. Kapoor:Fundamentals ofMathematicalStatistics,SultanChand&Sons,NewDelhi.
K.V.S.Sarma:StatisticsMadeSimple:Doit yourselfonPC.PHI.
M.R.Saluja: IndianOfficialStatistics.ISIpublications.

Referencebooks:

1. H. C. Saxena: Finite Differences and Numerical Analysis, S. Chand and Company, New Delhi.
2. P. P. Gupta, G. S. Malik & Sanjay Gupta: Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Media(P) Ltd., Meerut(UP), India.
3. S. S. Sastry: Introductory Methods Numerical Analysis, Prentice- Hall of India.
4. C. F. Gerald and P. O. Wheatley: Applied Numerical Analysis, Addison- Wesley, 1998.

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) (MAJOR PAPER)			
Course Code	TITLE OF THE COURSE COURSE 9: NUMERICAL ANALYSIS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Survey and Statistical tools	0	0	2	1

List of Experiments:

1. Interpolation by using Newton-Gregory forward and backward difference formulae.
2. Interpolation by using Gauss forward and backward difference formulae.
3. Interpolation by using Sterling and Bessel's formulae.
4. Interpolation by using Laplace-Everett's Formula.
5. Interpolation by using Newton's divided difference and Lagrange's formulae.
6. Inverse interpolation by using Lagrange's formula.
7. Determination of first and second order derivatives by using Newton-Gregory forward and backward difference formulae.
8. Determination of first and second order derivatives by using Gauss forward and backward difference formulae.
9. Determination of first and second order derivatives by using Newton's divided difference formula.
10. Numerical Integration by using Trapezoidal rule, Simpson's 1/3 rd, Simpson's 3/8 th rule and Weddle's rule.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. H. C. Saxena: Finite Differences and Numerical Analysis, S. Chand and Company, New Delhi.
2. P. P. Gupta, G. S. Malik & Sanjay Gupta: Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Media(P) Ltd., Meerut(UP), India.
3. S. S. Sastry: Introductory Methods Numerical Analysis, Prentice- Hall of India.
4. C. F. Gerald and P. O. Wheatley: Applied Numerical Analysis, Addison- Wesley, 1998.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Statistics/Semester-IV
COURSE 9: NUMERICAL ANALYSIS (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

- Given $y_0 = 3$, $y_1 = 12$, $y_3 = 200$, $y_4 = 100$. Find $\Delta^4 y_0$ without forming difference table
- Find the missing term in the following data.

	0	1	2	3	4
	1	3	9	..	81

- Given that $\sqrt{12500} = 111.803399$, $\sqrt{12510} = 111.848111$, $\sqrt{12520} = 111.892806$, $\sqrt{12530} = 111.937483$.
 $\sqrt{12516} = 111.874930$
- Explain Newton's Divided difference formula and Lagrange's formula
- Find $f'(1)$ for $f(x) = 1/(1+x^2)$ using the following table .

X	1.0	1.1	1.2	1.3	1.4
Y	0.5000	0.4524	0.4098	0.3717	0.3378

- Find $f'(2.5)$ from the following table

X	1.5	1.9	2.5	3.2	4.3	5.9
Y	3.375	6.059	13.625	29.368	73.907	196.57

- Evaluate $\int_1^4 (4x^2 - 3x) dx$ taking 10 intervals by trapezoidal rule
- Using Taylor's series method, find $f(0.1)$ correct to four decimal places if $f'(x) = 1 - x^2$ and $f(0) = 1$

SECTION-B

Answer any THREE questions

3X10=30M

- State and prove Newton – Gregory formula for forward interpolation with equal intervals
- From the following table , find the number of students who obtain less than 45 marks .

Marks	30-40	40-50	50-60	60-70	70-80
No.of students	31	42	51	35	31


- Find $f'(0.6)$ and $f''(0.6)$ from the following table .

x	0.4	0.5	0.6	0.7	0.8
f(x)	1.5836	1.7974	2.0442	2.3275	2.6510

- Apply Gauss forward formula to find the value of u_9 if $u_0 = 14$, $u_4 = 24$, $u_8 = 32$, $u_{16} = 40$.

- Evaluate the integral $\int_0^1 \log x dx$ using Weddle's rule.

- Given $y'' = 1 - y$ with $y(0) = 2$, find $y(0.1)$ and $y(0.2)$ correct to four decimal places by using Runge – Kuttamethod .

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 7: THEORY OF SAMPLING				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To review about the population and its concepts also methods to collect data and errors to deal.
2. Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
3. An idea of conducting the sample surveys and selecting appropriate sampling techniques.
4. Knowledge about comparing various sampling techniques.
5. To use appropriate factorial experimental to analyze the experimental data.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To review about the population and its concepts also methods to collect data and errors to deal.
CO2	Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.
CO3	An idea of conducting the sample surveys and selecting appropriate sampling techniques.
CO4	Knowledge about comparing various sampling techniques.
Co5	To use appropriate factorial experimental to analyze the experimental data.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Introduction to Sampling :

Brief review of parameter and statistic, sampling distribution. Principal steps and principles in a sample survey, sampling and non – sampling errors, advantages of sampling over census, limitations, types of sampling – concept of subjective, probability and mixed sampling.

Unit-2: Simple Random Sampling (with and without replacement):

Notations and terminology, various probabilities of selection. Random numbers tables and its uses. Methods of selecting simpler random sample, lottery method, method based on random numbers. Estimates of population total, mean and their variances and standard errors, determination of sample size, simpler random sampling of attributes.

Unit –3: Stratified random sampling:

Stratified random sampling, Advantages and Disadvantages of Stratified Random Sampling, Estimation of population mean, and its variance. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.

Unit –4: Systematic sampling:

Systematic sampling definition when $N = nk$ and merits and demerits of systematic sampling - estimate of mean and its variance. Comparison of systematic sampling with Stratified and SRSWOR. Comparison of variance of SRS, StRS and SYS for a linear trend. Concept of Cluster Sampling, Multistage Sampling and Quota Sampling.

Unit –5: National and International Official Statistical System:

National Statistical Organization: vision and mission, NSSO and CSO, roles and responsibilities, important activities, publications etc. National Statistical Commission: Need, Constitution, its role, functions, important facts.

Textbooks:

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar Nath Ram Nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 7: THEORY OF SAMPLING				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Survey and Statistical tools	0	0	2	1

List of Experiments:

1. Show the sample mean is unbiased estimator of population mean in SRSWOR and also find variance of sample mean.
2. Show the sample mean square is unbiased estimator of population mean square in SRSWOR.
3. Show the sample mean is unbiased estimator of population mean in SRSWR and also find variance of sample mean.
4. Compare means and variances between SRSWR and SRSWOR.
5. Allocation of sample sizes to various strata in proportional and in optimum allocations to draw a Stratified random sample.
6. Compare precision in proportional and optimum allocations with SRSWOR and gain in efficiency due to proportional and optimum allocations.
7. Systematic sampling with $N=nk$ and compare the precision of an estimate in systematic sampling with that of in Stratified and in SRSWOR.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
2. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd Web Links

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26
II B.Sc Computational Mathematics/Semester-IV
COURSE 7: THEORY OF SAMPLING (MINOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

- | | |
|---|-------------|
| 15. Explain short note on types of Sampling. | BT1,PO1,CO2 |
| 16. Explain about Sampling Errors and Non-sampling errors | BT3,PO3,CO2 |
| 17. Explain SRSWR vs SRSWOR | BT2,PO1,CO2 |
| 18. Explain allocations in Stratified Sampling | BT2,PO2,CO5 |
| 19. Explain Random numbers method | BT3,PO3,CO2 |
| 20. Explain Systematic Sampling | BT3,PO3,CO1 |
| 21. Explain NSSO | BT3,PO3,CO5 |
| 22. Explain National Statistical Commission | BT2,PO1,CO2 |

SECTION-B

Answer any THREE questions

3X10=30M


- | | |
|---|-------------|
| 23. Explain principal steps in sample survey.
(OR) | BT2,PO2,CO5 |
| 24. Show that $E(s^2)=S^2$ in SRSWOR. | BT2,PO2,CO3 |
| 25. Comparison of variance of SRS, StRS and SYS for a linear trend
(OR) | BT4,PO5,CO4 |
| 26. Show that $V(\bar{y}_{opt}) \leq V(\bar{y}_{prop}) \leq V(\bar{y}_{srswor})$ | BT2,PO2,CO3 |
| 27. Define Systematic sampling and write it's advantages and disadvantages.
(OR) | BT1,PO2,CO3 |
| 28. Explain the roles and responsibilities of C.S.O | BT2,PO2,CO2 |

II B.Sc Computational Mathematics/Semester-IV
Statistics Course–7: THEORY OF SAMPLING (MINOR PAPER)

Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Write the difference between sampling versus census.	BT1	PO2	C01
2	Explain about limitations of sampling.	BT1	PO2	CO3
3	Define (i)parameter (ii) statistic (iii) Sampling distribution.	BT3	PO5	CO2
4	Define simple random sampling	BT3	PO3	CO3
5	Illustrate the types of SRS.	BT2	PO1	C04
6	Explain about Random number method.	BT2	PO2	C04
7	Explain about Lottery method.	BT1	PO3	CO5
8	Describe about Determination of sample size.	BT3	PO1	CO5
9	Write about advantages and disadvantages of stratified random sampling.	BT1	PO2	CO3
10	Explain stratified random sampling.	BT3	PO5	CO2
11	Define Proportional and Optimum allocation.	BT3	PO3	CO3
12	Write about Merits and Demerits of systematic sampling.	BT2	PO1	C04
13	Explain about Systematic Sampling.	BT2	PO2	C04
14	Explain the concept of Cluster sampling	BT1	PO3	CO5
15	Define NSSO and CSO.	BT3	PO1	CO5

S.NO	Long Questions	BT	PO'S	CO'S
1	Explain principal steps in sample survey.	BT2	PO2	CO3
2	Explain about types of sampling.	BT2	PO3	CO3
3	Describe about sampling and non sampling errors.	BT1	PO2	CO3
4	Distinguish between SRSWR and SRSWOR.	BT3	PO4	CO3
5	Show that $E(s^2)=S^2$ in SRSWOR.	BT4	PO5	CO4
6	Show that sample mean is unbiased estimator of population mean in SRSWOR.	BT3	PO3	CO3
7	Explain stratified random sampling with proportional and optimum allocation.	BT2	PO2	CO3
8	Show that sample mean is unbiased estimator of population mean in Stratified random sampling.	BT2	PO3	CO3
9	Define stratified random sampling and write about mean and variance.	BT1	PO2	CO3
10	Show that $V(\bar{y}_{opt}) \leq V(\bar{y}_{prop}) \leq V(\bar{y}_{srswor})$	BT3	PO4	CO3
11	Define Systematic sampling and write it's advantages and disadvantages.	BT4	PO5	CO4
12	Explain the comparison of systematic sampling with Stratified and SRSWOR.	BT3	PO3	CO3
13	Describe the concept of when $N=nk$ in systematic sampling.	BT2	PO1	C04
14	Explain the functions of N.S.C	BT2	PO2	C04
15	Explain the roles and responsibilities of N.S.O	BT1	PO2	C01

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 8:DESIGN AND ANALYSIS OF EXPERIMENTS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After successful completion of the course students will be able to:

1. To acquaint with the role of statistics in different fields with special reference to agriculture.
2. Learn to apply the one of the designs of experiment to agricultural fields.
3. Learn to apply the randomization to the blocks of various fields in agriculture.
4. To get the familiarity about applications of three principles.
5. Learn to deal the agricultural fields with different factors and levels.
6. To use appropriate experimental designs to analyze the experimental data. Outcomes:

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the role of statistics in different fields with special reference to agriculture.
CO2	Learn to apply the one of the design of experiment to agricultural fields.
CO3	Learn to apply the randomization to the blocks of various fields in agriculture.
CO4	To get the familiarity about applications of three principles.
Co5	Learn to deal the agricultural fields with different factors and levels.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Analysis of variance (ANOVA):

Concept, Definition and assumptions. ANOVA one way classification – mathematical model, analysis – with equal and unequal classification. ANOVA two way classification – mathematical model, analysis and problems.

Unit-2: Completely Randomised Design (CRD):

Definition, terminology, Principles of design of experiments, CRD – Concept, advantages and disadvantages, applications, Layout, Statistical analysis. Critical Differences when hypothesis is significant.

Unit-3: Randomised Block Design (RBD):

Concept, advantages and disadvantages, applications, Layout, Statistical analysis and Critical Differences. Efficiency of RBD relative to CRD. RBD with one missing value and its analysis, problems.

Unit-4: Latin Square Design:

Concept, advantages and disadvantages, applications, Layout, Statistical analysis and Critical Differences. Efficiency of LSD over RBD and CRD. Estimation of one missing value in LSD and its analysis, problems.

Unit-5: Factorial experiments:

Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals

Textbooks:

7. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
8. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
9. M.R. Saluja: Indian Official Statistics. ISI publications.

Reference books:

10. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
11. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
12. M.R. Saluja: Indian Official Statistics. ISI publications.

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	Government College (Autonomous) Rajahmundry	Program & Semester II BSC.(Sem - IV) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 8: DESIGN AND ANALYSIS OF EXPERIMENTS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Survey and Statistical tools	0	0	2	1

List of Experiments:

1. ANOVA – one way classification with equal number of observations.
2. ANOVA – one way classification with unequal number of observations.
3. ANOVA – Two way classification.
4. Analysis of CRD and critical differences.
5. Analysis of RBD and critical differences. Relative efficiency of CRD with RBD.
6. Estimation of single missing observation in RBD and its analysis.
7. Analysis of LSD and efficiency of LSD over CRD and RBD.
8. Estimation of single missing observation in LSD and its analysis.

Suggested Co-curricular Activities:

8. Training of students by related industrial experts
9. Assignments including technical assignments if any.
10. Seminars, Group Discussions, Quiz, Debates on related topics.
11. Preparation of audio and video on tools of diagrammatic and graphical representations.
12. Collection of material/figures/photos/author photos of related topics.
13. Invited lectures and presentations of stalwarts on those topics.
14. Visits/field trips of firms, research organizations etc.

Reference books:

4. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
5. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.
6. M.R. Saluja: Indian Official Statistics. ISI publications.

Virtual Lab Links:

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM

CBCS SYLLABUS (Semester Wise) 2025-26

II B.Sc Computational Mathematics/Semester-IV

COURSE 8:DESIGN AND ANALYSIS OF EXPERIMENTS(MINOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

15. Write about assumptions of ANOVA. BT1,PO3,CO2
16. Write Short note on ANOVA BT1,PO3,CO1
17. Define completely randomized design (CRD) BT2,PO3,CO1
18. Explain about fixed effect & random effect model. BT3,PO2,CO4
19. Describe about applications for RBD. BT1,PO3,CO5
20. Write about advantages and disadvantages of LSD. BT2,PO3,CO3
21. Compare the Efficiencies of RBD over LSD BT3,PO3,CO3
22. Describe Yates procedure to find factorial effect totals. BT1,PO2,CO4

SECTION-B

Answer any THREE questions

3X10=30M

23. Explain ANOVA two way classification BT1,PO3,CO5
24. One way Classification Model Problem BT3,PO2,CO4
- Four Varieties of Fertilizers have been applied to Five plots each. the yield given below

Varieties	Plots				
	I	II	III	IV	V
1	1.9	2.2	2.6	1.8	2.1
2	2.5	1.9	2.3	2.6	2.2
3	1.7	1.9	2.2	2.0	2.1
4	2.1	1.8	2.5	2.3	2.4

25. Explain about CRD BT2,PO2,CO3
26. Explain missing plot technique is RBD BT2,PO2,CO3
27. Explain about LSD BT2,PO1,CO1
28. Explain 2^3 factorial experiments BT1,PO1,CO1

II B.Sc Computational Mathematics/Semester-IV

Course – 8: DESIGN AND ANALYSIS OF EXPERIMENTS (MINOR PAPER)

Question Bank

S.NO	Short Questions	BT	PO'S	CO'S
1	Write about assumptions of ANOVA.	BT1	PO2	CO1
2	Write Short note on ANOVA	BT1	PO2	CO3
3	Define completely randomized design (CRD)	BT3	PO5	CO2
4	Explain about fixed effect & random effect model.	BT3	PO3	CO3
5	Describe about applications for RBD.	BT2	PO1	CO4
6	Write about advantages and disadvantages of LSD.	BT2	PO2	CO4
7	Describe Yates procedure to find factorial effect totals.	BT1	PO3	CO5
8	Compare the Efficiencies of RBD over LSD	BT3	PO1	CO5
9	Main effects and interaction effects	BT1	PO2	CO3
10	Two way classification	BT3	PO5	CO2
11	Estimation of one missing value in LSD	BT3	PO3	CO3
12	Explain 2^3 factorial experiments	BT2	PO1	CO4
13	Explain 2^2 factorial experiments	BT2	PO2	CO4
14	Fertilizers have been applied to Five plots each.	BT1	PO3	CO5
15	Layout of LSD	BT3	PO1	CO5

S.NO	Long Questions	BT	PO'S	CO'S
1	Explain ANOVA one way classification	BT2	PO2	CO3
2	One way Classification Model Problem	BT2	PO3	CO3
3	Four Varieties of Fertilizers have been applied to Five plots each. the yield given below	BT1	PO2	CO3
4	Explain about CRD	BT3	PO4	CO3
5	Explain missing plot technique in RBD	BT4	PO5	CO4
6	Explain about LSD	BT3	PO3	CO3
7	Explain 2^n factorial experiments	BT2	PO2	CO3
8	Explain ANOVA two way classification	BT2	PO3	CO3
9	Explain missing plot technique in RBD	BT1	PO2	CO3
10	Four Varieties of Fertilizers have been applied to Five plots each. the yield given below	BT3	PO4	CO3
11	Efficiency of RBD relative to CRD	BT4	PO5	CO4
12	Write Short note on ANOVA	BT3	PO3	CO3
13	Define completely randomized design (CRD)	BT2	PO1	CO4
14	Explain about fixed effect & random effect model.	BT2	PO2	CO4
15	Describe about applications for RBD.	BT1	PO2	CO1



GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

Estd: 1853; An Autonomous Institution & Accredited by NAAC at Grade 'A+'

East Godavari District -533 105, Andhra Pradesh, India

(Affiliated to Adikavi Nannayya University, Rajamahendravaram, A.P -533296)



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III B.Sc. Statistics (HONOURS)



DEPARTMENT OF STATISTICS

SEMESTER – V & VI

SYLLABUS


MODEL PAPERS & QUESTION BANKS

SEMESTER-V

(LONG TEAM INTERNSHIP)

SEMESTER-VI

MAJOR/MINOR	COURSE
III BSC STATISTICS (HONOURS)	
SKILL	ENVIRONMENTAL EDUCATION
MAJOR – 10	M10: APPLIED STATISTICS
MAJOR – 11	M11: COMPUTATIONAL TECHNIQUES AND R PROGRAMMING
MAJOR – 12	M12: OPERATION RESEARCH
MAJOR – 13	M13: OPTIMIZATION TECHNIQUES
III BSC COMPUTATIONAL MATHEMATICS (HONOURS)	
MINOR – 5	APPLIED STATISTICS
MINOR – 6	COMPUTATIONAL TECHNIQUES AND R PROGRAMMING

	Government College (Autonomous) Rajahmundry	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 10: APPLIED STATISTICS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After learning this course, the student will be able to know about

1. Forecasting Techniques and its applications.
2. Interpret and use a range of index numbers commonly used in the business sector.
3. Perform calculations involving simple and weighted index numbers.
4. Understand the basic structure of the Consumer price index and perform calculations involving its use.
5. Various data collection methods enabling to have a better insight in policy making, planning and systematic implementation.
6. Construction and implementation of life tables.
7. Population growth curves, population estimates and projections.
8. Real data implementation of various demographic concepts as outlined above through practical assignments.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	<input type="checkbox"/> <input type="checkbox"/> To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Time Series :

Time Series and its components with illustrations, additive, multiplicative and mixed models. Trend – Estimation of trend by free hand curve method, method of Semi Averages. Determination of trend by Least squares (Linear trend, parabolic trend only), Moving averages method.

Unit – 2: Seasonal Component :

Determination of seasonal indices by Simple Averages method, Ratio to Moving Average, Ratio to Trend and Link Relative methods, De-seasonalization.

Unit – 3: Index numbers :

Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and Weighted index numbers – Various Weighted Aggregate Index numbers, Criterion of a good index number, Fisher's ideal index number. Cost of living index number and Whole sale price index number.

Unit – 4: Vital Statistics :

Introduction, definition, and uses of vital statistics, sources of vital statistics. Measures of Mortality Rates – Crude Death Rate, Specific Death Rate, Standardised Death Rate with different populations and problems.

Unit – 5: Life table:

Life table – Columns, Construction and Uses of Life table, Proofs of life table functions. Measures of Fertility Rates – Crude Birth Rate, General Fertility Rate, Specific Fertility Rate, Total Fertility Rate. Measures of population growth – Pearls, Gross Reproduction Rate, Net Reproduction Rate and its problems.

Textbooks:

1. Fundamentals of Applied Statistics: V. K. Kapoor & S. C. Gupta.
2. Mukopadhyay, P(2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
3. Brock well, P.J. and Devis, R.A. (2003): Introduction to Time Series Analysis. Springer.

Referencebooks:

1. Chatfield, C.(2001): Time Series Forecasting, Chapman & Hall.
2. Srinivasan, K.(1998): Demographic Techniques and Applications. Sage Publications. 3.
3. Srivastava, O.S. (1983): A Text Book of Demography. Vikas Publishing House.

Web Links

- <https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code 225901P	TITLE OF THE COURSE COURSE 10: APPLIED STATISTICS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Measurement of trend by method of moving averages (odd and even period).
2. Measurement of trend by method of Least squares (linear and parabola).
3. Determination of seasonal indices by method of simple averages.
4. Determination of seasonal indices by method of Ratio to Moving Averages.
5. Determination of seasonal indices by method of Ratio to Trend.
6. Determination of seasonal indices by method of Link relatives.
7. Computation of simple index numbers.
8. Computation of all weighted index numbers.
9. Computation of reversal tests.
10. Computation of various Mortality rates.
11. Computation of various Fertility rates.
12. Computation of various Reproduction rates.
13. Construction of Life Table.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. Fundamentals of Applied Statistics: V. K. Kapoor & S. C. Gupta.
2. Mukopadhyay, P(2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
3. Brock well, P.J. and Devis, R.A. (2003): Introduction to Time Series Analysis. Springer.

Virtual Lab Links

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM

CBCS SYLLABUS (Semester Wise) 2025-26

III B.Sc Statistics/Semester-VI

COURSE 10: APPLIED STATISTICS (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

1. Write about Time Series and its components. BT1,PO3,CO2
2. Explain Cost of living Index numbersBT1,PO3,CO1
3. What are the sources of vital statistics BT2,PO3,CO1
4. Explain Gross reproduction rate and Net reproduction rate. BT3,PO2,CO4
5. Explain Methods population growth rates. BT1,PO3,CO5
6. Explain the method of Simple averagesBT2,PO3,CO3
7. Explain Abridged life tablesBT3,PO3,CO3
8. Explain the use of National incomeBT1,PO2,CO4

SECTION-B

Answer any THREE questions

3X10=30M


9. Explain the components of Time series?BT1,PO3,CO5
10. Explain the problems involved in the construction of index numbersBT3,PO2,CO4
11. Explain the criteria of a good index number?BT2,PO2,CO3
12. Explain the functions and organization of CSO?BT2,PO2,CO3
13. Explain about various death rates? BT2,PO1,CO1
14. Explain life table and its Construction ?BT1,PO1,CO1

III B.Sc Statistics/Semester-VI
Course 10: APPLIED STATISTICS (MAJOR PAPER)

Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Explain time series	BT1	PO2	C01
2	Explain about trend and its measures	BT3	PO3	C01
3	Explain seasonal variations	BT2	P02	C02
4	Explain cyclical variations	BT1	PO1	CO2
5	Explain irregular variations	BT3	PO4	CO3
6	Explain time reversal test	BT2	PO2	CO3
7	Explain factor reversal test	BT2	PO3	CO3
8	Explain about base shifting	BT1	PO2	CO3
9	Explain about splicing	BT3	PO5	CO2
10	What are the sources of vital statistics?	BT3	PO3	CO3
11	Explain various crude and standardized death rates.	BT2	PO1	C04
12	Define complete expectation of life and curate expectation of life.	BT2	PO2	C04
13	Explain about abridged life tables.	BT1	PO3	CO5
14	What are the problems faced in estimating national income	BT3	PO1	CO5
15	Link relative method.			

S.N	Long Questions	BT	PO'S	CO'S
1	Explain the components of time series.	BT1	PO2	C01
2	Explain the estimating trend (straight line) in a time series in detail. What are its merits and demerits?	BT3	PO3	C01
3	Explain ratio to moving averages method to determine seasonal variations in a time series data. What are its merits and demerits?	BT2	P02	C02
4	Explain the various problems involved in the construction of index numbers.	BT1	PO1	CO2
5	Explain the criteria of a good index number	BT3	PO4	CO3
6	What are Cost of living index numbers? How do you construct it?	BT2	PO2	CO3
7	Distinguish between chain based and fixed base index numbers.	BT2	PO3	CO3
8	Explain about base shifting, Splicing and deflation of index numbers.	BT1	PO2	CO3
9	Explain about the functions and organization of CSO	BT3	PO4	CO3
10	Explain the National income and its computation	BT4	PO5	CO4
11	Explain about the functions and organization of NSSO	BT3	PO3	CO3
12	Explain various rates of measuring mortality. Discuss its merits and demerits.	BT2	PO1	C04
13	Explain various measures of fertility. Discuss its merits and demerits of these measures.	BT2	PO2	C04
14	Explain in detail the construction and uses of life tables.	BT1	PO3	CO5
15	Explain GRR and NRR in measuring population growth.			

	Government College (Autonomous) Rajahmundry	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 11: COMPUTATIONAL STATISTICS AND R PROGRAMMING				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After learning this course the student will be able

1. Students will be able to import and preprocess statistical datasets in R efficiently.
2. Students will demonstrate proficiency in basic data manipulation techniques for statistical preparation.
3. Students will apply R functions to handle real-world data issues like outliers and inconsistencies.
4. Students will compute and interpret descriptive statistics using R commands and packages.
5. Students will analyze data distributions and identify patterns or anomalies statistically.
6. Students will generate summary reports for datasets to support preliminary statistical insights.

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	To acquaint with estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	<input type="checkbox"/> <input type="checkbox"/> To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit 1: Basics of R for Statistical Data Handling :

R environment: Installation, command prompt, basic data types (vectors, matrices, data frames).
Data import/export: Reading from CSV, Excel, databases; handling missing values. Basic operations: Subsetting, merging datasets, applying functions.

Unit 2: Descriptive Statistics and Data Summarization in R :

Measures of central tendency (mean, median, mode) and variability (variance, standard deviation, range). Skewness, kurtosis, and quantiles; summary functions summary(), describe(). Handling categorical data: Frequency tables, cross-tabulations, and contingency tables.

Unit 3: Data Visualization for Statistical Insights in R :

Base R graphics: Histograms, boxplots, scatter plots, bar charts, residual plots for assumption checking in statistics.

Unit 4: Inferential Statistics and Hypothesis Testing in R:

Probability distributions in R: Normal, binomial, Poisson; random sampling (rnorm(), dbinom()). Hypothesis testing: t-tests, chi-square tests, ANOVA; p-values and confidence intervals. Non-parametric tests: Wilcoxon.

Unit 5: Regression Modeling in R:

Karl Pearson correlation coefficient, Spearman Rank correlation coefficient and simple linear regression (lm()).

Textbooks:

1. Chambers, J. (2008): Software for Data Analysis: Programming with R, Springer. 2.
- Crawley, M.J. (2017): The R Book, John Wiley & Sons.
3. Matloff, N.(2011): The Art of R Programming, No Starch Press, Inc.
4. Dr. Mark Gardener (2012): Beginning R The statistical Programming Languages, John Wiley & Sons.

Referencebooks:

5. Sudha G. Purohit, Sharad D.Gore, and Shailaja R. Deshmukh (2008), Statistics Using R, Narosa Publishing House, India.
6. Mark Gardener: “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
7. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, 2013.
8. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.
9. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014. .

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
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CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code 225901P	TITLE OF THE COURSE COURSE 11: COMPUTATIONAL STATISTICS AND R PROGRAMMING				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Data Import and Preprocessing: Import a dataset (e.g., iris.csv), handle missing values, and perform basic sub setting.
2. Descriptive Statistics Computation: Calculate mean, variance, and skewness for a sample dataset and interpret results.
3. Frequency Analysis: Create contingency tables and chi-square tests on categorical data.
4. Basic Visualizations: Generate histograms and boxplots to assess data normality.
5. Hypothesis Testing: Conduct t-tests and ANOVA on experimental data, reporting p-values.
6. Non-Parametric Tests: Apply the Wilcoxon tests and compare with parametric alternatives.
7. Linear Regression Modeling: Fit a simple linear model, plot residuals, and predict new values.

Note 1: Use real datasets from sources like UCI Machine Learning Repository or built-in R datasets (e.g., mtcars, airquality).

Note 2: Practical Problems must be done in Computer Lab at least 4 hours per month by using R.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
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2. Crawley, M.J. (2017): The R Book, John Wiley & Sons.
3. Matloff, N.(2011): The Art of R Programming, No Starch Press, Inc.

Virtual Lab Links


III B.Sc Statistics/Semester-VI

Course 11: **COMPUTATIONAL STATISTICS AND R PROGRAMMING** (MAJOR PAPER)

Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Define computer. What is the difference between System and Application software?	BT1	PO2	C01
2	What are the different types of computer Storages.	BT3	PO3	C01
3	Explain about creating charts in MS – Excel.	BT2	P02	C02
4	Describe the process of creating, saving and editing a workbook in MS Excel.	BT1	PO1	CO2
5	Describe the calculation various measures of central tendency and variability in R.	BT3	PO4	CO3
6	Discuss various types of visualizations in R	BT2	PO2	CO3
7	What are the input and output function available in R Programming?	BT2	PO3	CO3
8	Explain how do you represent data in R.	BT1	PO2	CO3
9	Explain the steps for fitting of straight line in Excel	BT3	PO5	CO2
10	What is p-value? How can you use it in interpretation.	BT3	PO3	CO3
11	Explain Arithmetic & logical operators in R.	BT2	PO1	C04
12	Write about basic functions in R	BT2	PO2	C04
13	Illustrate briefly sort and filter options in Excel.	BT1	PO3	CO5
14	Explain matrix operation using Excel functions.	BT3	PO1	CO5
15	How can you export Excel output to MS-Word.	BT3	PO2	CO5

S.N	Long Questions	BT	PO'S	CO'S
1	Describe basic applications of computer.	BT1	PO2	C01
2	Explain the types of software with examples.	BT3	PO3	C01
3	Explain Block diagram of computer and its components.	BT2	P02	C02
4	Discuss various programming languages their applications	BT1	PO1	CO2
5	Discuss data entry and editing features in Excel.	BT3	PO4	CO3
6	Explain Copy, Paste and Special paste options in Excel.	BT2	PO2	CO3
7	Explain how to create bar, line, and pie charts in Excel	BT2	PO3	CO3
8	Explain the steps for fitting of polynomial and power curves using Excel.	BT1	PO2	CO3
9	Discuss about data analysis Pak and its features.	BT3	PO4	CO3
10	Explain the steps to perform student's t-test using data analysis Pak.	BT4	PO5	CO4
11	Explain the steps to perform ANOVA using data analysis Pak	BT3	PO3	CO3
12	Explain the data types in R – programming.	BT2	PO1	C04
13	Explain Recycling, Filtering&Subsettingrelated to vectors in R.	BT2	PO2	C04
14	Describe vector creation and various operations on vectors in R with examples.	BT1	PO3	CO5
15	Explain the creation of matrix and various operations on matrices in R			

	Government College (Autonomous) Rajahmundry	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 12: OPERATIONS RESEARCH				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After learning this course, the student will be able

1. To know the scope of Operations Research.
2. To link the OR techniques with business environment and life sciences.
3. To convert real life problems into mathematical models.
4. To find a solution to the problem in different cases.
5. To inculcate logical thinking to find a solution to the problem.

Outcomes:

On Completion of the course, the students will be able to-

CO1	To acquaint with estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	<input type="checkbox"/> <input type="checkbox"/> To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Operations Research:

Introduction of OR – Origin and development of OR – Nature and features of OR – Scientific Method in OR – Modeling in OR – Advantages and limitations of Models – General Solution methods of OR models – Applications of Operation Research. Linear Programming problem (LPP) – Mathematical formulation of the problem - illustrations on Mathematical formulation of Linear Programming problem.

Unit – 2: Graphical solution of LPP :

Graphical solution of linear Programming problems with maximizing and minimizing objective function up to 3 variables. Finding convex hull and non-convex hull of LPP. Some exceptional cases - Alternative solutions, Unbounded solutions, non-existing feasible solutions by Graphical method.

Unit – 3: General linear Programming Problem (GLP):

Definition and Matrix form of GLP problem, Slack variable, Surplus variable, unrestricted Variable, Standard form of LPP and Canonical form of LPP. Definitions of Solution, Basic Solution, Degenerate Solution, Basic feasible Solution and Optimum Basic Feasible Solution. Introduction to Simplex method and Computational procedure of simplex algorithm. Solving LPP by Simplex method (Maximization case and Minimization case up to three variables only)

Unit – 4: Artificial variable technique :

Big – M method and Two-phase simplex method, Degeneracy in LPP and method to resolve degeneracy. Alternative solution, Unbounded solution, Non existing feasible solution and Solution of simultaneous equations by Simplex method.

Unit – 5: Duality in Linear Programming :

Concept of duality – Definition of Primal and Dual Problems, General rules for converting any primal into its Dual, Relation between the solution of Primal and Dual problem (statements only). Using duality to solve primal problem. Dual Simplex Method.

Textbooks:

1. S. D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P. K. Gupta, Manmohn: Operations Research, Sultan Chand and sons, New Delhi.
3. J. K. Sharma: Operations Research and Application, Mc. Millan and Company, New Delhi

Referencebooks:

1. Gass S. I: Linear Programming. Mc Graw Hill.
2. Hadly G: Linear Programming. Addison-Wesley.
3. Taha H.M: Operations Research: An Introduction: Mac Millan.

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code 225901P	TITLE OF THE COURSE COURSE 12: OPERATIONS RESEARCH				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Solution of Linear Programming Problem by using Graphical Method. 2. Solution of LPP with Simplex method.
3. Problem solving using Big M method.
4. Problem solving using Two Phase method.
5. Solution of special cases in LPP using Simplex method
 - i. Unbounded solution
 - ii. Alternative solutions.
6. Problems based on Principle of Duality.
7. Problems based on Dual simplex method.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and video on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S. D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P. K. Gupta, Manmoh: Operations Research, Sultan Chand and sons, New Delhi.
3. J. K. Sharma: Operations Research and Application, Mc.

Virtual Lab Links

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM

CBCS SYLLABUS (Semester Wise) 2025-26

III B.Sc Statistics/Semester-VI

COURSE 12: OPERATIONS RESEARCH (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

1. Explain the formulation of LPP BT1,PO3,CO2
2. Write advantages and disadvantages of O.R BT1,PO3,CO1
3. Explain General LPP BT1,PO3,CO1
4. How do you obtain a sequence? BT1,PO3,CO5
5. Explain Concept of Two –Phase Method BT1,PO3,CO1
6. Explain the slack and surplus Variables
7. Explain assignment problem as a special case of TP. BT1,PO3,CO1
8. Explain the concept of Artificial Variable Technique BT1,PO3,CO1

SECTION-B

Answer any THREE questions


3X10=30M

9. Describe the Nature and Scope of O.R BT1,PO3,CO1
10. Solve the Following LPP by using Graphical Method BT1,PO3,CO2
Maximize $Z=45X_1+80X_2$
Subject to const: $5X_1+20X_2 \leq 400$ $10X_1+15X_2 \leq 450$ $X_1, X_2 \geq 0$
11. Use simplex Method to solve the following LPP BT1,PO3,CO2
Maximize $Z=X_1-X_2+3X_3$
Subject to const: $X_1+X_2+X_3 \leq 10$ $2X_1-X_3 \leq 2$ $2X_1-2X_2+3X_3 \leq 0$, $X_1, X_2, X_3 \geq 0$
12. Mathematical formulation of LPP. graphical solution of LPP BT1,PO3,CO3
13. Solve the following LPP using duality. BT1,PO3,CO4
14. Dual simplex method. BT1,PO3,CO5

III B.Sc Statistics/Semester-VI
Course 12: OPERATIONS RESEARCH (MAJOR PAPER)
Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Matrix form of linear programming problem	BT1	PO2	C01
2	Graphical solution of LPP	BT3	PO3	C01
3	Applications of O.R	BT2	P02	C02
4	Significant features of O.R	BT1	PO1	CO2
5	Slack and surplus variables	BT3	PO4	CO3
6	Mathematical formulation of LPP.	BT2	PO2	CO3
7	Define general linear programming problem	BT2	PO3	CO3
8	Show that dual of the dual is primal	BT1	PO2	CO3
9	Define basic feasible solution	BT3	PO5	CO2
10	Define an artificial variable	BT3	PO3	CO3
11	What is duality in LPP	BT2	PO1	C04
12	State fundamental theorem of duality	BT2	PO2	C04
13	Define an unbounded solution	BT1	PO3	CO5
14	Define an infeasible solution	BT3	PO1	CO5
15	Define feasible solution	BT3	PO2	CO5

S.N	Long Questions	BT	PO'S	CO'S
1	Define operations research. Explain meaning and scope of O.R	BT1	PO2	C01
2	Explain various phases of operations research	BT3	PO3	C01
3	Explain graphical solutions for solving a linear programming problem	BT2	P02	C02
4	Explain simplex method to solve an LPP simplex algorithm	BT1	PO1	CO2
5	Explain the procedure for big 'M' to solve a LPP algorithm	BT3	PO4	CO3
6	Explain the procedure for two phases to solve a LPP	BT2	PO2	CO3
7	Solve the following LPP using simplex method (i) maximize Problems	BT2	PO3	CO3
8	Solve due following LPP using Big 'M' method Problems	BT1	PO2	CO3
9	Solve the following LPP using two phase method	BT3	PO4	CO3
10	Duality in linear programming problem and formulation of dual LPP	BT4	PO5	CO4
11	Dual simplex method	BT3	PO3	CO3
12	Solve the following LPP using duality	BT2	PO1	C04
13	Explain Concept of Two –Phase Method	BT3	PO3	CO3
14	Definition of Primal and Dual Problems	BT3	PO3	CO3
15	Relation between the solution of Primal and Dual problem	BT2	PO1	C04

	Government College (Autonomous) Rajahmundry	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code	TITLE OF THE COURSE COURSE 13: OPTIMIZATION TECHNIQUES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After learning this course, the student will be able

1. To solve the problems in logistics.
2. To find a solution for the problems having space constraints.
3. To minimize the total elapsed time in industry by efficient allocation of jobs to the suitable persons.
4. To find a solution for an adequate usage of human resources.
5. To find the most plausible solutions in industries and agriculture when a random environment exists

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	<input type="checkbox"/> <input type="checkbox"/> To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Transportation Problem :

Introduction, Mathematical formulation of Transportation problem. Definition of Initial Basic feasible solution of Transportation problem – North – West corner rule, Lowest cost entry method, Vogel's approximation method. Method of finding optimal solution – MODI method. Degeneracy in transportation problem, Resolution of degeneracy, Unbalanced transportation problem. Maximization of TP.

Unit – 2: Assignment Problem :

Introduction, Mathematical formulation of Assignment problem, Hungarian Method for solving Assignment for both balanced and unbalanced Assignment Problems.

Unit – 3: Sequencing problem:

Introduction and assumptions of sequencing problem, Johnson's algorithm and problems for n jobs on two machines problem. Algorithm and problems for n jobs on three machines problem. Algorithm and problems for n jobs on m machines problem.

Unit – 4: Game Theory:

Two-person zero sum games. Pure and Mixed strategies. Maxmin and Minimax Principles, Saddle point and its existence. Games without Saddle point. Mixed strategies. Solution of 2 x 2 rectangular games. Graphical method of solving 2 x n and m x 2 games. Dominance Property.

Unit – 5: Network Scheduling: Basic Components of a network, nodes and arcs, events and activities – Rules of Network construction – Time calculations in networks - Critical Path method (CPM) and PERT.

Textbooks:

1. S. D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P. K. Gupta, Manmoh: Operations Research, Sultan Chand and sons, New Delhi.
3. J. K. Sharma: Operations Research and Application, Mc. Millan and Company, New Delhi.

Referencebooks:

1. Gass S. I: Linear Programming. Mc Graw Hill.
2. Hadly G: Linear Programming. Addison-Wesley.
3. Taha H.M: Operations Research: An Introduction: Mac Millan.

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester III BSc (Sem - VI) MAJOR PAPER			
Course Code 225901P	TITLE OF THE COURSE COURSE 13: OPTIMIZATION TECHNIQUES				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. IBFS of transportation problem by using North West corner rule, LCEM and VAM.
2. Optimum solution to balanced and unbalanced transportation problems by MODI method (Minimization cases).
3. Solution of Assignment problem using Hungarian method (Minimization cases).
4. Solution of sequencing problem — processing of n jobs through two machines.
5. Solution of sequencing problem – processing of n jobs through three machines.
6. To perform Project scheduling of a given project (Deterministic case - CPM).
7. To perform Project scheduling of a given project (Probabilistic case - PERT).
8. Solution of 0 m x n games by dominance rule.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. S. D. Sharma: Operations Research, Kedar Nath Ram Nath & Co, Meerut.
2. Kanti Swarup, P. K. Gupta, Manmohn: Operations Research, Sultan Chand and sons, New Delhi.
3. J. K. Sharma: Operations Research and Application, Mc. Millan and Company, New Delhi.
4. Gass S. I: Linear Programming. Mc Graw Hill.
5. Hadly G: Linear Programming. Addison-Wesley.
6. Taha H.M: Operations Research: An Introduction: Mac Millan.

Virtual Lab Links

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26

III B.Sc Statistics/Semester-VI

COURSE 13: OPTIMIZATION TECHNIQUES (MAJOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

- | | |
|---|-------------|
| 1. Explain pure and mixed strategies. | BT1,PO3,CO1 |
| 2. Explain different types of inventories. | BT1,PO3,CO2 |
| 3. Explain the determination of EOQ with one price break. | BT1,PO3,CO3 |
| 4. Write about game theory. | BT1,PO3,CO2 |
| 5. Write basic steps in PERT technique | BT1,PO3,CO5 |
| 6. Write rules for drawing net work diagram. | BT1,PO3,CO5 |
| 7. Explain Errors in networking | BT1,PO3,CO4 |
| 8. Write short note on queuing theory. | BT1,PO3,CO4 |

SECTION-B

Answer any THREE questions

3X10=30M

9. North-west corner rule

	D1	D2	D3	D4	Availability
O1	5	3	6	7	19
O2	4	7	9	1	37
O3	3	4	7	5	34
Requirements	16	18	31	25	...

10. Write procedure of graphical method to solve 2Xn games BT1,PO3,CO2

11. Solve the following A.P BT1,PO3,CO3

	I	II	III	IV
A	30	25	26	28
B	26	32	24	20
C	20	22	18	27
D	23	20	21	19

12. Find the optimum time of completion of project ,when the time of completion of each task is as follows :A<D ,E ; B,D< F ; C<G ;B ,G<H ;F,G< I. BT1,PO3,CO4

Task	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10

13. Explain the differences between CPM and PERT BT1,PO3,CO5


14. n jobs – 3 machines problem BT1,PO3,CO5

III B.Sc Statistics/Semester-VI
Course 13: OPTIMIZATION TECHNIQUES (MAJOR PAPER)

Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Explain the formulation of LPP	BT1	PO2	C01
2	Explain general LPP	BT3	PO3	C01
3	Explain the standard form of LPP	BT2	P02	C02
4	Define feasible solution of a Transportation problem	BT1	PO1	CO2
5	Define basic feasible solution in a Transportation problem	BT3	PO4	CO3
6	Define optimum solution of a transportation problem	BT2	PO2	CO3
7	Explain loop in a transportation table with properties	BT2	PO3	CO3
8	Define Degeneracy in a transportation problem	BT1	PO2	CO3
9	Explain the formulation of Assignment problem	BT3	PO5	CO2
10	Maximization method	BT3	PO3	CO3
11	Explain Errors in networking	BT2	PO1	C04
12	Explain the sequencing problem	BT2	PO2	C04
13	Unbalanced Assignment problem	BT1	PO3	CO5
14	Write basic steps in PERT technique	BT3	PO1	CO5
15	Write rules for drawing net work diagram.	BT3	PO2	CO5

S.N	Long Questions	BT	PO'S	CO'S
1	problem – North – West corner rule	BT1	PO2	C01
2	PERT technique	BT3	PO3	C01
3	North-west corner rule	BT2	P02	C02
4	Least cost entry methods	BT1	PO1	CO2
5	VAM method for a given transportation	BT3	PO4	CO3
6	Explain Hungarian method in obtaining optimal solution	BT2	PO2	CO3
7	Explain Travelling salesman method	BT2	PO3	CO3
8	Explain Errors in networking	BT1	PO2	CO3
9	Write procedure of graphical method to solve $2 \times n$ games	BT3	PO4	CO3
10	Explain the cost associate with inventories	BT4	PO5	CO4
11	Travelling salesman method	BT3	PO3	CO3
12	Write rules for drawing net work diagram	BT2	PO1	C04
13	Explain the differences between CPM and PERT	BT2	PO2	C04
14	n jobs – 2 machines problem	BT1	PO3	CO5
15	n jobs – 3 machines problem	BT1	PO3	CO5

	Government College (Autonomous) Rajahmundry	Program & Semester III BSc (Sem - VI) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE : APPLIED STATISTICS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After learning this course, the student will be able to know about

1. Forecasting Techniques and its applications.
2. Interpret and use a range of index numbers commonly used in the business sector.
3. Perform calculations involving simple and weighted index numbers.
4. Understand the basic structure of the Consumer price index and perform calculations involving its use.
5. Various data collection methods enabling to have a better insight in policy making, planning and systematic implementation.
6. Construction and implementation of life tables.
7. Population growth curves, population estimates and projections.
8. Real data implementation of various demographic concepts as outlined above through practical assignments.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	To acquaint with the estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	<input type="checkbox"/> <input type="checkbox"/> To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – 1: Time Series :

Time Series and its components with illustrations, additive, multiplicative and mixed models. Trend – Estimation of trend by free hand curve method, method of Semi Averages. Determination of trend by Least squares (Linear trend, parabolic trend only), Moving averages method.

Unit – 2: Seasonal Component :

Determination of seasonal indices by Simple Averages method, Ratio to Moving Average, Ratio to Trend and Link Relative methods, De-seasonalization.

Unit – 3: Index numbers :

Concept, construction, problems involved in the construction of index numbers, uses and limitations. Simple and Weighted index numbers – Various Weighted Aggregate Index numbers, Criterion of a good index number, Fisher's ideal index number. Cost of living index number and Whole sale price index number.

Unit – 4: Vital Statistics :

Introduction, definition, and uses of vital statistics, sources of vital statistics. Measures of Mortality Rates – Crude Death Rate, Specific Death Rate, Standardised Death Rate with different populations and problems.

Unit – 5: Life table:

Life table – Columns, Construction and Uses of Life table, Proofs of life table functions. Measures of Fertility Rates – Crude Birth Rate, General Fertility Rate, Specific Fertility Rate, Total Fertility Rate. Measures of population growth – Pearls, Gross Reproduction Rate, Net Reproduction Rate and its problems.

Textbooks:

1. Fundamentals of Applied Statistics: V. K. Kapoor & S. C. Gupta.
2. Mukopadhyay, P(2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
3. Brock well, P.J. and Devis, R.A. (2003): Introduction to Time Series Analysis. Springer.

Referencebooks:

1. Chatfield, C.(2001): Time Series Forecasting, Chapman & Hall.
2. Srinivasan, K.(1998): Demographic Techniques and Applications. Sage Publications. 3.
- Srivastava, O.S. (1983): A Text Book of Demography. Vikas Publishing House.

Web Links

- <https://builtin.com/data-science/intro-descriptive-statistics>
<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photos of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester III BSc (Sem - VI) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE : APPLIED STATISTICS				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Measurement of trend by method of moving averages (odd and even period).
2. Measurement of trend by method of Least squares (linear and parabola).
3. Determination of seasonal indices by method of simple averages.
4. Determination of seasonal indices by method of Ratio to Moving Averages.
5. Determination of seasonal indices by method of Ratio to Trend.
6. Determination of seasonal indices by method of Link relatives.
7. Computation of simple index numbers.
8. Computation of all weighted index numbers.
9. Computation of reversal tests.
10. Computation of various Mortality rates.
11. Computation of various Fertility rates.
12. Computation of various Reproduction rates.
13. Construction of Life Table.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. Fundamentals of Applied Statistics: V. K. Kapoor & S. C. Gupta.
2. Mukopadhyay, P(2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied Pvt. Ltd.
3. Brock well, P.J. and Devis, R.A. (2003): Introduction to Time Series Analysis. Springer.

Virtual Lab Links

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
CBCS SYLLABUS (Semester Wise) 2025-26

III B.Sc Computational Mathematics/Semester-VI

COURSE : APPLIED STATISTICS (MINOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

15. Write about Time Series and its components. BT1,PO3,CO2
16. Explain Cost of living Index numbersBT1,PO3,CO1
17. What are the sources of vital statistics BT2,PO3,CO1
18. Explain Gross reproduction rate and Net reproduction rate. BT3,PO2,CO4
19. Explain Methods population growth rates. BT1,PO3,CO5
20. Explain the method of Simple averagesBT2,PO3,CO3
21. Explain Abridged life tablesBT3,PO3,CO3
22. Explain the use of National incomeBT1,PO2,CO4

SECTION-B

Answer any THREE questions

3X10=30M

23. Explain the components of Time series?BT1,PO3,CO5
24. Explain the problems involved in the construction of index numbersBT3,PO2,CO4
25. Explain the criteria of a good index number?BT2,PO2,CO3
26. Explain the functions and organization of CSO?BT2,PO2,CO3
27. Explain about various death rates? BT2,PO1,CO1
28. Explain life table and its Construction ?BT1,PO1,CO1


III B.Sc Computational Mathematics/Semester-VI

Course : **APPLIED STATISTICS (MINOR PAPER)**

Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Explain time series	BT1	PO2	C01
2	Explain about trend and its measures	BT3	PO3	C01
3	Explain seasonal variations	BT2	P02	C02
4	Explain cyclical variations	BT1	PO1	CO2
5	Explain irregular variations	BT3	PO4	CO3
6	Explain time reversal test	BT2	PO2	CO3
7	Explain factor reversal test	BT2	PO3	CO3
8	Explain about base shifting	BT1	PO2	CO3
9	Explain about splicing	BT3	PO5	CO2
10	What are the sources of vital statistics?	BT3	PO3	CO3
11	Explain various crude and standardized death rates.	BT2	PO1	C04
12	Define complete expectation of life and curate expectation of life.	BT2	PO2	C04
13	Explain about abridged life tables.	BT1	PO3	CO5
14	What are the problems faced in estimating national income	BT3	PO1	CO5
15	Link relative method.			

S.N	Long Questions	BT	PO'S	CO'S
1	Explain the components of time series.	BT1	PO2	C01
2	Explain the estimating trend (straight line) in a time series in detail. What are its merits and demerits?	BT3	PO3	C01
3	Explain ratio to moving averages method to determine seasonal variations in a time series data. What are its merits and demerits?	BT2	P02	C02
4	Explain the various problems involved in the construction of index numbers.	BT1	PO1	CO2
5	Explain the criteria of a good index number	BT3	PO4	CO3
6	What are Cost of living index numbers? How do you construct it?	BT2	PO2	CO3
7	Distinguish between chain based and fixed base index numbers.	BT2	PO3	CO3
8	Explain about base shifting, Splicing and deflation of index numbers.	BT1	PO2	CO3
9	Explain about the functions and organization of CSO	BT3	PO4	CO3
10	Explain the National income and its computation	BT4	PO5	CO4
11	Explain about the functions and organization of NSSO	BT3	PO3	CO3
12	Explain various rates of measuring mortality. Discuss its merits and demerits.	BT2	PO1	C04
13	Explain various measures of fertility. Discuss its merits and demerits of these measures.	BT2	PO2	C04
14	Explain in detail the construction and uses of life tables.	BT1	PO3	CO5
15	Explain GRR and NRR in measuring population growth.			

	Government College (Autonomous) Rajahmundry	Program & Semester III BSc (Sem - VI) MINOR PAPER			
Course Code	TITLE OF THE COURSE COURSE: COMPUTATIONAL STATISTICS AND R PROGRAMMING				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistical applications	0	3	2	3

Course Objectives:

After learning this course the student will be able

1. Students will be able to import and preprocess statistical datasets in R efficiently.
2. Students will demonstrate proficiency in basic data manipulation techniques for statistical preparation.
3. Students will apply R functions to handle real-world data issues like outliers and inconsistencies.
4. Students will compute and interpret descriptive statistics using R commands and packages.
5. Students will analyze data distributions and identify patterns or anomalies statistically.
6. Students will generate summary reports for datasets to support preliminary statistical insights.

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	To acquaint with estimator, estimates, estimation techniques and its properties.
CO2	To acquire knowledge of testing the hypothesis of different distributions.
CO3	<input type="checkbox"/> <input type="checkbox"/> To learn about the large sample techniques by using various tools.
CO4	To learn about the small sample techniques by using various tools.
Co5	To deal with the situation where there is no parameters to the distributions

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit 1: Basics of R for Statistical Data Handling :

R environment: Installation, command prompt, basic data types (vectors, matrices, data frames).
Data import/export: Reading from CSV, Excel, databases; handling missing values. Basic operations: Subsetting, merging datasets, applying functions.

Unit 2: Descriptive Statistics and Data Summarization in R :

Measures of central tendency (mean, median, mode) and variability (variance, standard deviation, range). Skewness, kurtosis, and quantiles; summary functions summary(), describe(). Handling categorical data: Frequency tables, cross-tabulations, and contingency tables.

Unit 3: Data Visualization for Statistical Insights in R :

Base R graphics: Histograms, boxplots, scatter plots, bar charts, residual plots for assumption checking in statistics.

Unit 4: Inferential Statistics and Hypothesis Testing in R:

Probability distributions in R: Normal, binomial, Poisson; random sampling (rnorm(), dbinom()). Hypothesis testing: t-tests, chi-square tests, ANOVA; p-values and confidence intervals. Non-parametric tests: Wilcoxon.

Unit 5: Regression Modeling in R:

Karl Pearson correlation coefficient, Spearman Rank correlation coefficient and simple linear regression .

Textbooks:

1. Chambers, J. (2008): Software for Data Analysis: Programming with R, Springer. 2.
- Crawley, M.J. (2017): The R Book, John Wiley & Sons.
3. Matloff, N.(2011): The Art of R Programming, No Starch Press, Inc.
4. Dr. Mark Gardener (2012): Beginning R The statistical Programming Languages, John Wiley & Sons.

Referencebooks:

5. Sudha G. Purohit, Sharad D.Gore, and Shailaja R. Deshmukh (2008), Statistics Using R, Narosa Publishing House, India.
6. Mark Gardener: “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
7. W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, 2013.
8. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.
9. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014. .

Web Links

<https://builtin.com/data-science/intro-descriptive-statistics>

<https://builtin.com/data-science/descriptive-statistic>

Activities:


1. Training of students by related industrial experts.
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc. on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	3	2	3	2	2	2	2
CO2	2	3	3	2	1	3	2	3	1	1	2	2	2
CO3	3	1	2	3	3	2	2	2	2	3	3	2	1
CO4	2	2	3	2	2	2	1	2	3	2	2	2	2
CO5	1	2	2	1	2	2	2	1	2	1	2	1	2

Blue Print :

Model blue print for the Question Paper setter			
Unit	Short Answer Questions	Essay Questions	Marks allotted to the Unit/Chapter
I	2	1	20
II	2	1	20
III	1	1	15
IV	2	1	20
V	1	2	25
Total including choice	8	6	100

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester III BSc (Sem - VI) MINOR PAPER			
Course Code 225901P	TITLE OF THE COURSE COURSE : COMPUTATIONAL STATISTICS AND R PROGRAMMING				
Practical	Hours Allocated: (Lab)	L	T	P	C
Pre-requisites:	Basic knowledge in Statistics	0	0	2	1

List of Experiments:

1. Data Import and Preprocessing: Import a dataset (e.g., iris.csv), handle missing values, and perform basic sub setting.
2. Descriptive Statistics Computation: Calculate mean, variance, and skewness for a sample dataset and interpret results.
3. Frequency Analysis: Create contingency tables and chi-square tests on categorical data.
4. Basic Visualizations: Generate histograms and boxplots to assess data normality.
5. Hypothesis Testing: Conduct t-tests and ANOVA on experimental data, reporting p-values.
6. Non-Parametric Tests: Apply the Wilcoxon tests and compare with parametric alternatives.
7. Linear Regression Modeling: Fit a simple linear model, plot residuals, and predict new values.

Note 1: Use real datasets from sources like UCI Machine Learning Repository or built-in R datasets (e.g., mtcars, airquality).

Note 2: Practical Problems must be done in Computer Lab at least 4 hours per month by using R.

Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.

Reference books:

1. Chambers, J. (2008): Software for Data Analysis: Programming with R, Springer.
2. Crawley, M.J. (2017): The R Book, John Wiley & Sons.
3. Matloff, N.(2011): The Art of R Programming, No Starch Press, Inc.

Virtual Lab Links

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM

CBCS SYLLABUS (Semester Wise) 2025-26

III B.Sc Computational Mathematics/Semester-VI

COURSE : COMPUTATIONAL STATISTICS AND R PROGRAMMING (MINOR PAPER)

Time: 2 ½ hrs

MODEL PAPER

Max Marks: 50

SECTION-A

Answer any FIVE questions.

5 X4 =20M

15. Define computer. What is the difference between System and Application software. BT1,PO3,CO2
16. What are the different types of computer StoragesBT1,PO3,CO1
17. Explain about creating charts in MS – ExcelBT2,PO3,CO1
18. Explain about R Programming. And write down the features of R ProgrammingBT3,PO2,CO4
19. What are the input and output function available in R ProgrammingBT1,PO3,CO5
20. Describe the process of creating, saving and editing a workbook in MS ExcelBT2,PO3,CO3
21. Explain how do you represent data in RBT3,PO3,CO3
22. What is a cell and cell address? How can you restrict someone from copying a cell from your worksheet?BT1,PO2,CO4

SECTION-B

Answer any THREE questions

3X10=30M

23. Explain the various computer language. BT1,PO3,CO5
24. What is Operating System? Discuss about some popular Operating SystemsBT3,PO2,CO4
25. What is a function in MS Excel? Explain the various Statistical functions available in MS Excel.BT2,PO2,CO3
26. Explain how to perform one-way ANOVA using a data analysis Pak. Also explain how to predict the R square value from the output.BT2,PO2,CO3
27. Write a R program to create a matrix, taking a given vector of numbers as input and perform matrix addition and multiplicationBT2,PO1,CO1
28. Define operators. Explain arithmetic and relational operators in R-ProgrammingBT1,PO1,CO1

III B.Sc Computational Mathematics/Semester-VI

Course : COMPUTATIONAL STATISTICS AND R PROGRAMMING (MINOR PAPER)


Question Bank

S.N	Short Questions	BT	PO'S	CO'S
1	Define computer. What is the difference between System and Application software?	BT1	PO2	C01
2	What are the different types of computer Storages.	BT3	PO3	C01
3	Explain about creating charts in MS – Excel.	BT2	P02	C02
4	Describe the process of creating, saving and editing a workbook in MS Excel.	BT1	PO1	CO2
5	Describe the calculation various measures of central tendency and variability in R.	BT3	PO4	CO3
6	Discuss various types of visualizations in R	BT2	PO2	CO3
7	What are the input and output function available in R Programming?	BT2	PO3	CO3
8	Explain how do you represent data in R.	BT1	PO2	CO3
9	Explain the steps for fitting of straight line in Excel	BT3	PO5	CO2
10	What is p-value? How can you use it in interpretation.	BT3	PO3	CO3
11	Explain Arithmetic & logical operators in R.	BT2	PO1	C04
12	Write about basic functions in R	BT2	PO2	C04
13	Illustrate briefly sort and filter options in Excel.	BT1	PO3	CO5
14	Explain matrix operation using Excel functions.	BT3	PO1	CO5
15	How can you export Excel output to MS-Word.	BT3	PO2	CO5

S.N	Long Questions	BT	PO'S	CO'S
1	Describe basic applications of computer.	BT1	PO2	C01
2	Explain the types of software with examples.	BT3	PO3	C01
3	Explain Block diagram of computer and its components.	BT2	P02	C02
4	Discuss various programming languages their applications	BT1	PO1	CO2
5	Discuss data entry and editing features in Excel.	BT3	PO4	CO3
6	Explain Copy, Paste and Special paste options in Excel.	BT2	PO2	CO3
7	Explain how to create bar, line, and pie charts in Excel	BT2	PO3	CO3
8	Explain the steps for fitting of polynomial and power curves using Excel.	BT1	PO2	CO3
9	Discuss about data analysis Pak and its features.	BT3	PO4	CO3
10	Explain the steps to perform student's t-test using data analysis Pak.	BT4	PO5	CO4
11	Explain the steps to perform ANOVA using data analysis Pak	BT3	PO3	CO3
12	Explain the data types in R – programming.	BT2	PO1	C04
13	Explain Recycling, Filtering&Subsettingrelated to vectors in R.	BT2	PO2	C04
14	Describe vector creation and various operations on vectors in R with examples.	BT1	PO3	CO5
15	Explain the creation of matrix and various operations on matrices in R			

CERTIFICATE COURSE

S.NO	COURSE
1	STATISTICAL TOOLS FOR RESEARCH METHODOLOGY

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester II B.Sc.Sem-4			
Course Code	TITLE OF THE COURSE STATISTICAL TOOLS FOR RESEARCH METHODOLOGY				
	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in statistics	0	4	3	3

Objectives:

The objective of the paper is to serve the graduate, Post graduate students, research scholars and all disciplines of various colleges/universities and all those who are interested in doing research studies of one part or the other

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Students would be able to learn about research
CO2	Students would be able to learn about research problem
CO3	Students would be to learn Research design
CO4	Students would be able to data analysis
CO5	Students would be to statistical tests

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit – I - Research methodology-An Introduction:

Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of research, Research Methods Versus Methodology, Research and Scientific method, Research Process, Criteria of good Research, Problems encountered by Researchers in India.

Unit-II -Defining the Research Problem:

What is a Research Problem? Selecting the problem, Necessity and Defining the Problem, Techniques involved in defining a problem, Illustration, Conclusion Report Writing.

UNIT-III ----Data Collection and Data Management:

Sampling fundamentals and designs—Defining Population, Sample, Characteristic, sampling and non Sampling errors , Probability---Simple Random, Stratified random, Systematic Sampling.Non Probability Sampling Methods of data Collection, interview method, Observation method and questionnaire method).

UNIT-IV --- Statistical Tools:

Statistical Measures-measures of central tendency, (Mean, Median and Mode for grouped and Ungrouped data), Measures of Dispersion (Range, Mean deviation, Standard deviation Quartiles, Variance, Skewness)

UNIT-V ----Data Analysis Techniques:

Tests of Significance (Chi-square test, t-test, Paired t test, Z test), Analysis of Variance, Correlation and Regression,

Textbooks:

1. Research Methodology-Methods and Techniques—Third Edition-New Age International Publishers by C R Kothari and Gaurav Garg.
2. Research Methodology-A step by step for beginners-1st edition by Ranjit Kumar

Reference books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi
2. Goon AM, Gupta MK, Das Gupta B : Outlines of Statistics , Vol-II, the World Press Pvt.Ltd, Kolkata.

WebLinks:

1. <https://conjointly.com/kb/descriptive-statistics/>
2. https://en.wikipedia.org/wiki/Descriptive_statistics

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High] '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

Blue Print :

Model blue print for the Question Paper setter		
Unit	Essay Questions	Marks allotted to the Unit/Chapter
I	2	10
II	2	10
III	2	10
IV	1	10
V	1	10
Total including choice	8	50

GOVERNMENT COLLEGE(AUTONOMOUS) RAJAHMUNDRY
DEPARTMENT OF STATISTICS
UG-CERTIFICATE COURSE-2025-26
SEMESTER-IV

Common for all B.A, B.Sc, B.Com,
STATISTICAL TOOLS FOR RESEARCH METHODOLOGY
MODEL PAPER

Time : 2 hrs

Max Marks : 50


Answer ALL the following questions

5 x 10 = 50 M

1. Briefly describe the different steps involved in a Research process ?
2. What do you mean by research ? Explain its significance in modern times?
3. Explain Chi-square and t tests of significance?
4. Discuss about Correlation and Regression?
5. Define simple random Sample and explain the procedure of selecting a random sample ?
6. Explain Data collection?
7. Explain Measures of Central tendency?
8. Explain Measures of Dispersion?

**MDC: MULTI DISCIPLINARY COURSES
SEMESTER - 4**

S.NO	COURSE
1	MDC: BASICS STATISTICS

	GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY	Program & Semester II B.A.(SEM-IV)			
Course Code	TITLE OF THE COURSE MULTI DISCIPLINARY COURSES : BASICS STATISTICS				
	Hours Allocated: 30 hrs	L	T	P	C
Pre-requisites:	Basic knowledge in statistics	0	4	0	0

Syllabus

Unit I:

Meaning, scope and limitations of Statistics Collection of data: Primary and Secondary, Classification and Tabulation, Construction of frequency distribution. Graphical Representation: Histogram, Bar, Pie and Frequency polygon.

Unit II:

Measures of Central Tendency: Features of good average, Arithmetic Mean, Median, Mode. Empirical relationship between Mean Median and Mode

Unit III:

Measures of Dispersion: Range, Quartile Deviation (QD), Mean Deviation (MD), Standard Deviation (SD), relationship between QD, MD and SD.

Blue Print :

Model blue print for the Question Paper setter		
Unit	Essay Questions	Marks allotted to the Unit/Chapter
I	3	14
II	3	14
III	2	07
Multiple Choice Questions		
I	5	05
II	5	05
III	5	05
Total including choice	8 Questions + 15 MCQ	50

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
II YEAR /Semester-IV
MDC Paper - BASICS STATISTICS
MODEL QUESTION PAPER - 2025-26

Time: 2 hrs

Max Marks: 50

SECTION-A

Answer any FIVE questions

5 x 7 =35M

1. Explain Collection of data and its types?
2. Explain Scope of statistics?
3. Find arithmetic mean to the following data?

x	1	2	3	4	5
F	5	8	10	12	6

4. Calculate mean deviation the following data?

Class interval	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Frequency	5	10	15	10	5

5. Explain the Histogram and its example diagram?
6. Compute Standard deviation of the values 10,6,8,12,20?
7. Designing for using Questionnaire and a Schedule?
8. Explain the Median and its ungrouped and grouped data?

SECTION-B

Answer all of the questions.

15 x 1 = 15M

1. Before any procedures for _____ are established, the purpose and the scope of the study must be clearly specified.

a) Data analysis b) Data tabulation c) **Data collection** d) Data selection

2. The classification of data according to location is what classification:

a) Chronological b) Quantitative c) Qualitative d) **Geographical**

3. A function very similar to that of sorting letters in a post office is :

a) Mean b) Standard deviation c) **Classification** d) Mean deviation

4. Editing would also help eliminate inconsistencies or obvious errors due to treatment.

a) Characteristic b) **Arithmetical** c) Calculation d) Tabulation

5. When an investigator uses the data which has already been collected by others, such data is called _____.

a) Primary data b) Collected data c) Processed data d) **Secondary data**

6. In statistics _____ classification groups the data according to locational differences among the items.

a) Chronological b) **Geographical** c) Regional d) Alphabetical

7. The first step in tabulation is:

a) Footnote b) Source note c) Captions d) **Classification**

8. A systematic arrangement of data in rows and columns is:

a) **Table** b) Tabulation c) Body d) All the above

9. One dimensional diagram is:

a) **Line diagram** b) Rectangles c) Cubes d) Squares

10. Type of bar diagram is:

a) Pictogram b) **Sub divided diagram** c) Line diagrams d) Pie diagram

11. The median of a frequency distribution is found graphically with the help of:

- a) Histogram b) Frequency curve c) Frequency polygon d) **Ogive**

12. The classification of data according to location is what classification:

- a) Chronological b) Quantitative c) Qualitative d) **Geographical**

13. Mean deviation which is calculated is minimum at:

- a) Mean b) **Median** c) Mode d) All the three

14. Find the range for the following data

14,16,16,14,22,13,15,24,12,23,14,20,17,21,22,18,18,19,20,17,16,15,11,12,21,20,
17,18,19,23.

- a) **13** b) 12 c) 14 d) 16

15. Find the median of the run made by a player in 5 T20 matches, 55,44, 21, 35, 45

- a) 55 b) 21 c) **44** d) 35
-