P.R. GOVERNMENT COLLEGE (A), KAKINADA

DEPARTMENT OF STATISTICS

Objectives of Department of Statistics:

- To inspire knowledge across different areas in Statistics and Actuarial Science.
- To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency and Dispersion, Probability and Distributions, Statistical Methods, Inference, Sampling methods, Experimental Designs, Economical and Vital Statistics, SQC, reliability and Operations Research.
- To impart knowledge on Actuarial Science concepts like basics of Economics, Financial Accounting and Mathematics, Surviving models, life contingences, Business communication, Actuarial Statistics , Mortality and Insurance,
- To equip our students with good quality to appear for competitive examinations.
- To make the students to understand the needs of Statistics and Actuarial Science in Science, Technology and various industries like manufacturing, construction, insurance, IT, Pharmacy, etc.
- To inculcate research atmosphere among students by assigning projects.
- To provide learning environment by organizing industrial/field visits.
- To conduct remedial classes to slow learners and assign research work to advance learners in collaboration with industries.
- To organize guest lectures by inviting the resource persons from in and outside of universities for improving quality in education
- To celebrate significant days like, National/World Statistics Day, Mathematics Day, Science Day, etc
- To upgrade the students with latest Technology and Statistical softwares.
- To make the students to join in Post Gradation in the domain of Statistics/Actuarial Science/related subjects in top universities after completion of their UG course
- To make the students to get placements in Govt. and Private sectors in various positions viz, Assistant Statistical Officer, AD, Statistician, Data Analyst, Data Scientist, Business Analyst, Actuarial Analyst, Actuary, Risk Analyst, Bank PO, etc.

➢ The Department of Statistics is offering two **B.Sc**. courses **MSCs** and **MSAs**,

PROGRAMME OUTCOMES

For every degree program expectations are listed out by the institution under the Program Outcomes.

PO1. Knowledge and Understanding of:

1. All concepts at under graduate level.
2. Real life applications of these concepts and relationship between them.

PO2. Intellectual skills – be able to:

1. Think logically and arrange real life situations to mathematical form.
2. Assimilate knowledge and ideas based on wide reading and through the internet.
3. Transfer of appropriate knowledge and methods from one topic to another within the subject.
4. Understand the evolving state of knowledge in a rapidly developing field.

PO3. Transferable skills:

1. Use of IT (word-processing, use of internet for doing project).
2. Ability to work as part of a team.
3. Ability to use library resources/Equipment.
4. Time management.

PO4. Problem analysis:

1. Conversion of real life problem to Mathematical model and analyze with suitable Statistical tools.
2. Conduct investigations of complex problems: Use research-based knowledge.

PO5. Ethics:

1. Apply ethical principles, commit environment and responsibilities among students.

PO6. Individual and team work:

1. Function effectively as an individual and as a member in diverse teams, and in multidisciplinary settings.

PO7. Communication:

1. Communicate effectively on complex group activities and with society at large. Speak, read, write and listen clearly in person and through electronic media .

PO8. Critical Thinking:

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

PO9. Effective Citizenship:

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

PO10. Life-long learning:

1. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

S. No.	Programme	PSO
1	B.Sc. (Mathematics, Statistics, Computer Science) (Code: BS 11)	PSO1: To understand nature, scope, basic concepts and terminology of the three courses of the programme.
		PSO2: To identify and understand the applications of the three courses in different areas like, physical sciences, life sciences, arts and humanities, Business, various industries, etc
		PSO3: To solve various real life problems by developing mathematical model and applying various statistical tools with the help of computer programming knowledge.
		PSO4: To develop research thinking to solve critical problems.
2	B.Sc. (Mathematics, Statistics, Actuarial Science) (Code: BS 14)	PSO1: To understand nature, scope, basic concepts and terminology of the three courses of the programme.
		PSO2: To identify and understand the applications of the three courses in different areas like, physical sciences, life sciences, arts and humanities, Business, Insurance, various industries, etc
		PSO3: To solve various real life problems by developing mathematical model and applying various statistical tools with the help of suitable economic, finance and risk policies.
		PSO4: To develop research thinking to solve critical problems.

P.R. Government College(Autonomous), Kakinada, A.P.
STRUCTURE OF C.B.C.S. MODEL CURRICULUM IN STATISTICS

Yr.	Sem & Course (Th / Lab)	Course Title	Workload Hrs./week	Credits	Max. Marks		
					Intrnl.	Extrnl	Tot.
I	I Sem. Course-I Theory	Descriptive Statistics& Probability	4 Hrs	3	40	60	100
	I Sem Course-I Lab	Practical – I	3 Hrs	2	–	–	50
	II sem Course-II Theory	Probability Distributions & Statistical Methods	4 Hrs	3	40	60	100
	II sem Course-II Lab	Practical – II	3 Hrs	2	–	–	50
II	III Sem Course-III Theory	Statistical Methods &Inference	4 Hrs	3	40	60	100
	III Sem Course-III Lab	Practical-III	3 Hrs	2	–	–	50
	IV Sem Course IV Theory	Testing of Hypothesis	4 Hrs	3	40	60	100
	IV Sem Course IV Lab	Practical-IV	3 Hrs	2	–	–	50
III	V Sem Course V Theory	Sampling & Design of Experiments	3 Hrs	3	40	60	100
	V Sem Course V Lab.	Practical-V	3 Hrs	2	–	–	50
	V sem Course VI Theory	Applied Statistics	3 Hrs	3	40	60	100
	V sem Course VI Lab	Practical-VI	3Hrs	2	–	–	50

	VI sem Course VII Theory	**Elective 1**: SQC & Optimization Techniques (or) **Elective2**:Actuarial Statistics	3 Hrs	3	40	60	100
	VI sem Course VII Lab	Practical-VII(EI) (or) Practical-VII(EII)	3 Hrs	2			50
	VI Sem Course VIII Theory	**Cluster A** 1:Operations Research **2**:Advanced Designs of Experiment 3. Econometrics Project work (or)	 3 Hrs 3 Hrs 3 Hrs 2Hrs	 3 3 3 2	 40 40 40	 60 60 60	 100 100 100 50
		Cluster B 1. Operations Research -I 2. Operations Research-II 3. Econometrics Project work	 3 Hrs 3 Hrs 3 Hrs 2 Hrs	 3 3 3 2	 40 40 40	 60 60 60	 100 100 100 50
	VI Sem. Course VIII Lab I & II	Practical-VIII-A1 & A2 (or) Practical-VIII-B1 & B2	3 Hrs 3 Hrs	2 2			50 50
Life Skill Course	**II Sem**	Elementary Statistics	2 Hrs	2		50	50
Open to all	**Certificate Course 01**	SPSS	40 Hrs				50
Open to all	**Certificate Course 02**	Descriptive Statistics with R	40 Hrs				50

OBJECTIVE OF THE COURSE

Statistics is a key to success in the field of science and technology. Today, the students need a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of statistical ideas and tools to use them effectively in modeling, interpreting and solving the real life problems. Statistics plays an important role in the context of globalization of Indian economy, modern technology, computer science and information technology.

The main objectives of the course are

- To build the basis for promoting theoretical and application aspects of statistics.
- To underline the statistics as a science of decision making in the real life problems with the description of uncertainty.
- To emphasize the relevance of statistical tools and techniques of analysis in the study of inter-disciplinary sciences.
- To acquaint students with various statistical methods and their applications in different fields.
- To cultivate statistical thinking among students.
- To develop skills in handling complex problems in data analysis and research design.
- To prepare students for future courses having quantitative components.

This course is aimed at preparing the students to hope with the latest developments and compete with students from other universities and put them on the right track.

Course Outcomes (CO's) of Statistics

S. No	Year & Sem	Course No. & Title of the Course	Course Outcomes
1	I Year & I Sem	Course-I: Descriptive Statistics & Probability	After completion of this course, the students will acquire CO 01: knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency, dispersion, etc.
			CO 02: ability to distinguish between random and non-random experiments and conceptualize the probabilities of events including frequentic and axiomatic approach
			CO 03: knowledge to apply the theory of probability and also conditional probability including Bayes' law
			CO 04: knowledge related to concept of discrete and continuous random variables and their probability distributions
			CO.05: knowledge related to concept of mathematical expectation, moments and generating functions and application of inequalities
2	I Year & II Sem	Course-II: Probability Distributions & Statistical Methods	After completion of this course, the students will acquire CO 01: knowledge of important discrete distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric distributions and to apply in relevant situations
			CO 02: knowledge of important continuous distributions such as normal, uniform, exponential, beta and gamma distributions and to apply in relevant situations
			CO 03: Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations

			CO 04: knowledge to fit suitable curve for observed data to study its past behavior and forecasting for future.
			CO 05: knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes
3	II Year & III Sem	Course-III: Statistical Methods and Inference	After completion of this course, the students are able to CO 01: fit various curves (straight line, parabola, exponential, etc) using principle of least squares and analyze the categorical data to find the association between two or more attributes
			CO 02: understand and study the relationship between two or more variables and apply regression analysis to predict one variable from other variable(s) in real life problems
			CO 03: understand the basic concepts of sampling and learn exact sampling distributions such as chi-square, t and F and apply these properties wherever applicable
			CO 04: learn the criteria of a good estimator and find the estimators with the criteria for the parameters of various populations and also apply various methods(MLE, etc) to find the best estimators
4	II Year & IV Sem	Course-IV: Testing of Hypothesis	After completion of this course, the students are able to CO 01: understand basic terminology of testing of hypothesis such as types, errors, etc and apply large sample tests to draw inferences for real life problems
			CO 02: understand randomized and non-randomized tests and learn NP lemma and apply this lemma to determine best critical region for a test
			CO 03: analyze various real life problems by applying small sample tests, chi-square, t and F for testing

			means, variances, etc.
			CO 04: understand the difference between parametric and non-parametric tests and their applicable conditions and apply non-parametric tests (Sign, Run, U, etc) to analyze real life problems
5	III Year & V Sem	Course-V: Sampling & Design of Experiments	After completion of this course, the students are able to CO 01: understand the different types of sampling and adopt suitable method and also learn and apply the simple random sampling to estimate the parameters and error in estimates.
			CO 02: understand and apply stratified and systematic sampling methods for estimating parameters with relevant error.
			CO 03: analyze one-way and two-way classifications by the technique of ANOVA with assumptions
			CO 04: understand the principles of experimental designs and design and test various hypothetical problems as CRD, RBD and LSD
6	III Year & V Sem	Course-VI: Applied Statistics	After completion of this course, the students are able to CO 01: study a times series for estimating the effect of its components trend and seasonal variations by different methods
			CO 02: understand various types of index numbers and apply an appropriate formula to find index of various items and also study the cost of living of a group of people and calculate their deflated figures.
			CO 03: understand elasticity of demand and supply and learn various methods to find the elasticity and income distribution
			CO 04: apply various mortality, fertility and reproduction rates to study and compare various places regarding death and birth and also construct

			life tables
7	III Year & VI Sem	Course-VII(E-I): SQC and Optimization Techniques	After completion of this course, the students are able to CO 01: understand the concept of quality control in industry and apply the techniques of process and product control for checking and diagnosis of lack of quality
			CO 02: understand the reliability of successful running of an item and learn hazard function-exponential distribution as a special case and also calculate the reliability of various systems with series, parallel and k out of n configurations.
			CO 03: understand the origin, scope and applications of operations research and apply graphical and simplex methods to solve LPP.
			CO 04: apply various artificial techniques (Big-M and Two-phase) to solve the LPP's for which artificial variables are required and understand the concept of duality and application.
8	III Year & VI Sem	Paper-VII(E-II): Actuarial Statistics	After completion of this course, the students are able to CO 01: understand utility theory, insurance and prepare and study life tables with reference to mortality
			CO 02: understand multiple life functions and annuities and calculate the single and multiple decrement rates.
			CO 03: understand various life annuities- discrete, continuous, and calculate these with-immediate or due
			CO 04: understand and calculate net premiums-continuous, discrete and monthly .
9	III Year & VI Sem	Course-VIII(A1): Operations	After completion of this course, the students are able to CO 01: understand the objective of transportation

		Research	problem and apply various methods(NWC, LCM, VAM.MODI) to solve this problem(balanced and unbalanced) for optimum solution
			CO 02: understand the objective of the assignment problem and apply assignment algorithm to solve the problem(balanced and unbalanced) and study the travelling salesman problem
			CO 03: understand the objective and assumptions of sequencing problem and apply the algorithm to solve the problem with n jobs on 2 and 3 machines
			CO 04: understand the decision making under conflict- game theory and apply various techniques (maximin-minimax, dominance, algebraic, graphical) to solve the games with and without saddle points.
10	III Year & VI Sem	Course-VIII(A2): Advanced Design of Experiments	After completion of this course, the students are able to CO 01: understand the analysis of CRD, RBD and LSD and apply these in relevant areas
			CO 02: deal the analysis of RBD and LSD with one and two missing values
			CO 03: understand the ANCOVA and analyze CRD and RBD with one covariate.
			CO 04:understand the factorial designs, 2^2,2^3,3^2 and find the main and interaction effects
11	III Year & VI Sem	Course-VIII(B1): Operations Research-I	After completion of this course, the students are able to CO 01: understand and apply revised simplex method to solve a LPP and also apply the technique bounded variables to solve LPP
			CO 02: understand the objective of transportation problem and apply various methods(NWC, LCM, VAM.MODI) to solve this problem(balanced and unbalanced) for optimum solution
			CO 03: understand the objective of the assignment

			problem and apply assignment algorithm to solve the problem(balanced and unbalanced) and study the travelling salesman problem
			CO 04: understand the objective and assumptions of sequencing problem and apply the algorithm to solve the problem with n jobs on 2 and 3 machines
12	III Year & VI Sem	Course-VIII(B2): Operations Research-II	After completion of this course, the students are able to CO 01: understand the decision making under conflict- game theory and apply various techniques (maximin-minimax, dominance, algebraic, graphical) to solve the games with and without saddle points.
			CO 02: understand the concept of inventory and its control and apply various EOQ models to solve real life problems under different physical conditions.
			CO 03: understand the concept of price breaks and apply the methodology to solve such problems and also deal with problems with uncertain demand.
			CO 04: understand the rules to draw a network for a project and apply CPM and PERT to prepare and analyze network schedules of various projects.
13	III Year & VI Sem	Course-VIII(A3,B3): Econometrics	After completion of this course, the students are able to CO 01: understand the scope and objectives of econometrics
			CO 02: construct and study an econometric model (regression model) and estimate and test the parameters
			CO 03: understand the general linear model and its assumptions and also estimate and test the parameters by least square method
			CO 04: understand the concept of multi co-linearity and its effects and detect the multi co-linearity and its remedies. And have idea about auto correlation

Model Blue Print for Statistics Question paper and choice for all years (Duration; 2 1/2 Hrs)

S.No.	Type of Questions	To be given in the Question paper			To be answered		
		No. of Questions	Marks allotted to each question	Total marks	No. of Questions	Marks allotted to each question	Total marks
1	**SECTION – A** **Short Answer Questions**	6	5	30	4	5	20
2	**SECTION-B** **Essay Questions**	4	10	40	2	10	20
3	**SECTION-C** **Essay Questions**	4	10	40	2	10	20
TOTAL		14		110	8		60

Inernal Assessment : 20 marks

QUESTION PAPER PATTERN FOR 40 MARKS (Duration: 1:15 Hrs)

S.No	Type of question	No. Of questions given	No. Of questions to be answered	Marks allotted to each question	Total Marks
1	**Part-I** Very short questions	**5**	**5**	**2**	**10**
2	**Part-II** Essay Questions	**6**	**4**	**7 1/2**	**30**
Total					**40**
Average of Two Intaernal Asseessments is taken for 20 marks					

Continuous Assessment: 20 Marks

1. Student Seminar : 5 M
2. Assingnments : 10 M
3. Task/Quiz : 5 M

Practical Exam Question paper pattern: (Duration: 2 Hrs)

Practical: Five Questions will be given.

The Student has to answer three questions**.** **3x12=36 M**

Record: **10M**

Viva: **4M**

TOTAL: **50M**

Note: No External evaluation for practical exam in odd sem