GOVERNMENT ARTS COLLEGE (Autonomous),

(Re-accredited with 'A' Grade by NAAC and Affiliated to Bharathidasan University, Tiruchirappalli)

KARUR - 639 005.

UG

COURSE STRUCTURE

Course Structure under CBCS System

(Applicable to the Candidates admitted from the Academic Year 2021 – 2022 onwards)

B.Sc.,

STATISTICS

GOVERNMENT ARTS COLLEGE (Autonomous),

KARUR - 639 005

Course structure under CBCS system

UNDERGRADUATE COURSES

ABOUT THE DEPARTMENT OF STATISTICS

The Department of Statistics was established in 2012. Currently, the department offers B.Sc. Statistics, programme. The department educates the students to excel in statistics. The department updates the students of latest developments and equips the students in handling current statistical software for analyzing the data. Our curriculum makes students statistical thinking and apply the statistical tools to the real-life situations. There is a good collection of books in department with latest titles in various areas of statistics.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS)

VISION

It is our vision to persuade every mind in this temple of learning to tirelessly seek the truth to face the challenges of the times and honestly participate in the establishment of universal peace, progress and love.

MISSION

It is our mission to create in everyone an honest searching mind to be ready for value-based creative citizenship for regional, national and global peace and progress.

DEPARTMENT OF STATISTICS

VISION

- To develop the quality of life of individuals and society through the smart and moral use of statistics. To impart knowledge on the theoretical and application aspects of statistics. To train the students in the application oriented aspects using statistics

MISSION

- To open student's minds to the power and utility of the statistics and to develop their understanding, problem solving and analytical thinking skills. To serve the society through the expansion of industry and education. To create opportunities for more employment., Strengthening practical knowledge in the subject.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For UG courses, a student must earn a minimum of **140 (+4)** credits as mentioned in the table below. The total number of minimum courses offered by a department is given in the course pattern.

UNDER GRADUATE COURSEPATTERN (2021 ONWARDS)

PART	SEMESTER	SPECIFICATION	NO.OF COURSES	HOURS	CREDITS	TOTAL CREDITS
I	I - IV	Part I	**4**	**22**	**12**	**24**
II	I - IV	Part II	**4**	**22**	**12**	
III	I - VI	Core courses Theory	**9**	**50**	**43**	**93**
		Core Course Practical	**4**	**19**	**15**	
	I - IV	Allied Course	**4**	**20**	**14**	
		Allied Course Practical	**2**	**9**	**6**	
	V - VI	Elective Course	**3**	**17**	**15**	
IV	I - VI	Value Education Environmental Studies Soft Skills Development	**3**	**6**	**6**	**19 + (4)**
	I - III	Value Added Course (CLP)	**2**	**4**	**2**	
		Extra Credit Course (MOOC)	**1**	**-**	**2**	
	III - IV	Non Core Elective	**2**	**4**	**4**	
	V	Skill Based Elective - Theory	**3**	**6**	**9**	
V	VI	Gender Education	**1**	**1**	**1**	**2**
		Extension Activities	1	-	1	
TOTAL				**180**	**140 (+4)**	**140 (+4)**

Course Pattern

The Undergraduate degree course consists of five vital components. They are as follows:

Part - I: Language (Tamil)

Part - II: General English

Part - III: Core Course (Theory) Allied, Core Electives)

Part - IV: Value Education, Value Added Course, Extra Credit Course, Environmental Studies, Non Core Elective and Soft Skills Development.

Part - V: Gender Education and Extension Activities (NSS, NCC, Sports and Games, PEC, FAPA, YRC, RRC, RC, LC and CC).

Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practical's, Project work, field visits and etc.

Noncore elective

Noncore elective Core should be shared by the various Departments of college. This course should be opted by all the students belonging to the particular Department. Each department of the respective college should allocate themselves the schedule and the units of the course.

Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are THREE core electives. They are offered in different semesters according to the choice of the college.

Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. There are two extra credit courses - Massive Open Online Courses (MOOC) and Skill-based Course - offered in the III and V Semesters respectively. According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Skill based course is offered by the department apart from their regular class hours.

Value Education Courses

There are four courses offered in the first semesters for the First year students.

Non-Major Elective / Skill Based Elective

These courses are offered in two perspectives as electives "Within college".

Subject Code Fixation

The following code system (11 characters) is adopted for Under Graduate courses:

Year of Revision	UG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
21	**U21**	**x**	**x**	**xx**
21	**UST**	**1**	**x**	**1**

For example:

I B.Sc– Descriptive statistic,

The code of the paper is **U21 ST 1C1.**

Thus, the subject code is fixed for other subjects.

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks	
Passing Minimum: 40 Marks	
THEORY CIA MAXMIMUM = 25	THEORY CIA MINIMUM = 10
PRACTICAL CIA MAXIMUM = 40	PRACTICAL CIA MINIMUM = 16

End - Semester Tests

Centralized - Conducted by the office of Controller of Examinations.

Semester Examination

Testing with Objective and Descriptive questions.

Section - A: 10 Questions x 2 Marks = 20 Marks (No Choice - Two questions from each unit)

Section - B: 5 Questions x 5 Marks = 25 Marks (Either… or Type - One pair from each unit)

Section - C: 3 Questions x 10 Marks = 30 Marks (3 Out of 5 - One question from each unit)

Duration of Examination:

3- Hours examination for courses.

Grading System

1. Grading

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in Table 1.

From the second semester onwards the total performance within a semester and the continuous performance starting from the first semester are indicated by **Semester Grade Point Average (GPA)** and **Cumulative Grade Point Average (CGPA),** respectively. These two are calculated by the followingformulae

$$\textbf{GPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad \textbf{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

Where, 'C_i' is the Credit earned for the Course - i,

'G_i' is the Grade Point obtained by the student for the Course 'i'.

'M' is the marks obtained for the course 'i', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

2. Classification of Final Results

i) For each of the three parts, there shall be separate classification on the basis of the CGPA, as indicated in the following Table - 2.

ii) For the purpose of Classification of Final Results, the Candidates who earn CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 - 8.99, 7.00 - 7.99, 6.00 - 6.99 and 5.00 - 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good' and 'Above Average' respectively.

iii) Absence from an examination shall not be taken as an attempt.

Table - I - Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
40 and above but below 50	5	C
Below 40	0	RA

Table – 2 – Final Result

CGPA	Classification of Final Results	Corresponding Grade
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re - Appearance

Credit based weighted Mark System is adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

Declaration of Result:

Mr./Ms. _____ has successfully completed the Under Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part - III is _____ and the class secured is _____ by completing the minimum of 140 credits. The candidate has acquired _____ (if any) extra credits offered by the parent department courses.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR – 639 005

B.Sc., STATISTICS COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2021-2022 onwards)

PROGRAM OUTCOMES (POs)

On successful completion of the B. Sc., program, the graduates will be able to:

PO1: Prepare for competitive examinations and acquire skills to meet the challenges in job Placements.

PO2: Possess adequate knowledge in theory and Identify potential areas of applications on Diversified disciplines.

PO3: Well equipped with communicative Skill, Creative Knowledge, Attitude and innovative And expose to technical, analytical and creative skills.

PO4: Competent and socially responsible to expose their Leadership Responsibilities in their Fields with perfection and yardstick contribution.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of B. Sc., Statistics program, the students will:

PSO1: Understand theoretical knowledge in statistics.
PSO2: apply statistics in different fields.
PSO3: Skill in analyze statistical data and make interpretations.
PSO4: write computer programs and codes for statistical computation.
PSO5: Utilize statistical software effectively for data analysis.
PSO6: Use their statistical skills, computation and knowledge in other disciplinary courses and Projects.

Teaching, learning and evaluation methods:
Conventional black board, chalk and talk method, OHP, LCD, Smart board, ICT, Quiz, Online Quiz, Open book exams, Online Teaching, Examination, Group Discussion, Debate, Seminars Final Visit.

Bloom's Taxonomy Action verbs used for course objectives, outcomes and question setting. (K)*					
K1	**K2**	**K3**	**K4**	**K5**	**K6**
REMEMBERING	**UNDERSTANDING**	**APPLYING**	**ANALYSING**	**EVALUATING**	**CREATING**
List, Define, Describe, Recall Arrange, List, Outline, State Identify, etc.	Comprehension, Explain, Summarise Describe, Illustrate, Review, Classify, Clarify, Distinguish, Estimate, Give Example(S), Identify, etc.	Apply, Interpret, Manipulate, Relate, Use Compute, Demonstrate Illustrate, Sketch, Solve, etc.	Analyse, Compare Relate, Categorize Criticize, Diagram Differentiate, Distinguish, Infer, Examine, Outline, Experiment, Discuss, Point Out, etc.	Judge, Justify Assess, Estimate, Evaluate, Interpret Compare, Conclude, Describe, Explain, Determine, etc.	Create, Judge, Design, Rewrite Summarize Categorize, Develop, Formulate, Generate, Revise, Rearrange, Synthesize, etc.

Mapping Course Outcome with PO and POS

Strength level	**Low**	**Moderate**	**High**
value	**1**	**2**	**3**

Values Scaling

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

$$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No.of Pos \& PSOs}}$$

$$\text{Mean overall score for COs} = \frac{\text{Total of Mean Score of CO's}}{\text{Total No. of CO'S}}$$

GOVERNMENT ARTS COLLEGE (AUTONOMOUS),KARUR – 639 005

(Re-accredited with 'A' Grade by NAAC and Affiliated to Bharathidasan University, Triuchirappalli.)

B.Sc., STATISTICS COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2021-2022 onwards)

SEMESTER	PART	COURSE	COURSE TITLE	COURSE CODE	INSTR.HOURS WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
								INT	ESE	
I	I	Tamil - I	Tamil - I	**U21L1T1**	5	3	3	25	75	100
	II	English - II	English - II	**U21L1E1**	5	3	3	25	75	100
	III	Core Course - I	Descriptive Statistics	**U21ST1C1**	6	5	3	25	75	100
		Core Course - II	Statistical Computing Lab - I(Extended to II Semester)	-	3	-	-	-	-	-
		First Allied Course - I	Mathematics For Statistics - I (Matrix Theory)	**U21ST1A1**	5	3	3	25	75	100
		First Allied Course - II	Mathematics For Statistics - II (Real Analysis) (Extended to II Semester)	-	2	-	-	-	-	-
	IV	Valued Education	Value Education	**U21VE1**	2	2	3	25	75	100
		Value Added Course	CLP/SAP (Special Assistance Programme)	-	2	-				
					30	**16**				**500**
II	I	Tamil -II	Tamil - II	**U21L2T2**	5	3	3	25	75	100
	II	English - II	English - II	**U21L2E2**	5	3	3	25	75	100
	III	Core Course - II	Statistical computing Lab - I	**U21ST2C2P**	3	3	3	40	60	100
		Core Course - III	Probability Theory	**U21ST2C3**	6	5	3	25	75	100
		First Allied Course - II	Mathematics For Statistics- II (Real Analysis)	**U21ST2A2P**	2	3	3	40	60	100
		First Allied Course - III	Mathematics For Statistics - III (Numerical Analysis)	**U21ST2A3**	5	3	3	25	75	100
	IV	Environmental Studies	Environmental Studies	**U21ES2**	2	2	3	25	75	100
		Value Added Course.	CLP/SAP (Special Assistance Programme)	-	2	2				
					30	**24**				700
III	I	Tamil - III	Tamil - III	**U21L3T3**	6	3	3	25	75	100
	II	English - III	English - III	**U21L3E3**	6	3	3	25	75	100
	III	Core Course - IV	Distribution Theory	**U21ST3C4**	5	5	3	25	75	100
		Core Course - V	Statistical Computing Lab – II(Extended to IV Semester)		3	-	-	-	-	-
		Second Allied Course - I	Allied - R - Programming	**U21ST3A1**	5	4	3	25	75	100
		Second Allied Course - II	Allied – Practical - R - Programming (Extended to IV Semester)		3	-	-	-	-	-
	IV	Non Core Elective - I	Quantitative Aptitude - I	**U21MM3N3**	2	2	3	25	75	100
		Extra Credit Course	Massive open Online Course (MOOC)	-		(2)				
					30	**17**				500

IV	I	Tamil - IV	Tamil - IV	**U21L4T4**	6	3	3	25	75	100
	II	English - IV	English - IV	**U21L4E4**	6	3	3	25	75	100
	III	Core Course - V	Statistical Computing Lab - II	**U21ST4C5P**	2	4	3	40	60	100
		Core Course - VI	Statistical Estimation Theory	**U21ST4C6**	5	5	3	25	75	100
		Second Allied Course - II	Allied Practical - R - Programming	**U21ST4A2P**	2	3	3	40	60	100
		Second Allied Course - III	Operations Research	**U21ST4A3**	5	4	3	25	75	100
	IV	Skill Based Elective - I	Actuarial Statistics	**U21ST4S1**	2	3	3	25	75	100
		Non Core Elective - II	Quantitative Aptitude - II	**U21MM4N4**	2	2	3	25	75	100
					30	**27**				800
V	III	Core Course - VII	Testing Of Statistical Hypothesis	**U21ST5C7**	6	5	3	25	75	100
		Core Course - VIII	Sampling Theory	**U21ST5C8**	5	4	3	25	75	100
		Core Course - IX	Statistical Quality Control	**U21ST5C9**	5	4	3	25	75	100
		Core Course - X	Statistical Computing Lab - III	**U21ST5C10P**	3	4	3	40	60	100
		Elective Course - I	Bio - Statistics and Survival Analysis	**U21ST5E1**	5	5	3	25	75	100
	IV	Skill Based Elective - II	Data Analysis Using Python	**U21ST5S2**	2	3	3	25	75	100
		Skill Based Elective - III	Statistical Analysis Lab	**U21ST5S3P**	2	3	3	40	60	100
		Soft Skill Development	Soft Skill Development	**U21SSD3**	2	2	3	25	75	100
					30	**30**				800
VI	III	Core Course - XI	Design Of Experiments	**U21ST6C11**	6	5	3	25	75	100
		Core Course - XII	Stochastic Process	**U21ST6C12**	6	5	3	25	75	100
		Core Course - XIII	Statistical Computing Lab - IV	**U21ST6C13P**	5	4	3	40	60	100
		Elective Course - II	Official Statistics	**U21ST6E2**	6	5	3	25	75	100
		Elective Course - III	Demography	**U21ST6E3**	6	5	3	25	75	100
	II	Extension Activities	Extension Activities (NSS / NCC / RRB / YRC / FINE ARTS / Environmental Education / Population Education club / Rotaract club / Leo club / Consumer Club / Sports & Games)		-	1	-	-	-	-
			Gender Education	**U21EA4**	1	1	3	**25**	**75**	100
					30	**26**				**600**
	TOTAL				**180**	**140 + (4)**				**3900**

CHAIRMAN

BOARD OF STUDIES IN STATISTICS **CONTROLLER OF EXAMINATION**

CREDIT: 5 **COURSE CODE : U21STICI**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS - I SEMESTER - CORE COURSE – I

(For the candidates admitted from the year 2021-22 onwards)

DESCRIPTIVE STATISTICS

COURSE OBJECTIVES :

To make the Students to:

1. Understand the basic concepts of statistics.
2. Learn to present statistical data as graphical and Diagram representation.
3. Solve the problems in Descriptive statistics, dispersion, skewness and kurtosis.
4. Apply to fit linear and non-linear curves.
5. Solve the problems in bivariate data.

UNIT - I	Statistics - Definition, Nature, Characteristics Limitations and Scope. Data Collection and Presentation: Collection of data - Census - Sample surveys - Types of Data - Nominal, Ordinal, Interval and Ratio - Classification and Tabulation - Diagrammatic and Graphical representation of data.
UNIT - II	Measures of Central Tendency and Dispersion: Mean, Median, Mode, Geometric mean and Harmonic mean. Quartiles - Quartiles, Deciles and Percentiles. Mean deviation, Quartile deviation and Standard deviation and Coefficient of variation.
UNIT - III	Skewness - definition and types. Measures of skewness - Karl Pearson's coefficient of skewness - Bowley's co-efficient of Skewness. Kurtosis - definition and measures. Moments - first four raw moments and Central moments – Relation between raw and central moments.
UNIT - IV	Curve fitting: Principle of Least squares - Linear, Nonlinear, Exponential and Growth curves.
UNIT - V	Correlation - definition and types of correlation - measures of correlation - Karl Pearson's co - efficient of correlation - Spearman's Rank correlation co-efficient - Correlation co-efficient for bivariate data. Regression - regression lines - regression equation - properties of regression co-efficient.

TEXT BOOK :

1. GUPTA S.C., and KAPOOR V.K., (2004). "FUNDAMENTAL OF MATHEMATICAL STATISTICS" (11th –edition), Sultan Chand & Sons, New Delhi.

REFERENCE BOOK :

1. S.P.GUPTA., (2001). "STATISTICAL METHODS*"*, Sultan Chand & Sons, New Delhi.

NOTE: Question should be 80% Theory and 20% Problems

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Recall the basic statistics.	**K1**
CO2	Represent statistical data as diagrams and graphs.	**K2**
CO3	Frame the questionnaire and collect Primary data.	**K3**
CO4	To solve problems and to interpret the results of measures of central tendency and dispersion.	**K4**
CO5	To understand and apply to fit linear and non-linear curves.	**K3**
CO6	Analyse the Bivariate data in real life problems.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	-	-	3	2	2	2	2	3	**2.0**
CO2	3	3	3	1	3	3	3	2	2	3	**2.6**
CO3	3	3	3	1	3	3	3	2	2	3	**2.6**
CO4	3	3	2	2	3	3	3	2	2	3	**2.6**
CO5	3	3	2	1	3	3	3	2	2	3	**2.5**
CO6	3	3	2	2	3	3	3	2	2	3	**2.6**
							Mean Overall Score				**2.5**

Result: The core for this course is 2.5 (High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3 **COURSE CODE: U21ST1A1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – I SEMESTER - FIRST ALLIED COURSE – I

(For the candidates admitted from the year 2021-22 onwards)

MATHEMATICS FOR STATISTICS – I (MATRIX THEORY)

COURSE OBJECTIVES :

To make the Students to:

1. Solve systems of linear equations using multiple methods.
2. Determine characteristic roots and vectors.

UNIT - I	Matrices and System of Linear Equations: Transpose-Conjugate transpose- Reversal law for the transpose and conjugate transpose - Ad joint of a matrix - Inverse of a matrix - Singular and Non –Singular matrices - symmetric, skew-symmetric, Hermitian, skew-Hermitian. Partitioning of matrices. Chap 1 Sec 1.5.1, 1.5.2 & 1.5.3, 1.6.5, 1.6.6, 1.6.7, 1.6.8 Chap 2 Sec 2.8, 2.13, 2.14, 2.14.1, 2.14.3, 2.17
UNIT - II	Rank of a matrix: Elementary transformations - Elementary matrices - rank of a matrix - Invariance of rank through elementary transformations - Reduction to Normal form - Rank of product of matrices - Equivalent matrices. Chap 4 Sec 4.2, 4.3, 4.4, 4.8, 4.9, 4.12, 4.14
UNIT - III	Characteristic Roots and Vectors: Matrix polynomials - Characteristic roots and vectors - Cayley- Hamilton theorem - Minimal equation of a matrix. Chap 11 Sec 11.1, 11.8, 11.11, 11.12
UNIT - IV	Orthogonal and Unitary matrices - Use of inverse of a matrix to find the solution of a system of linear equations - conditions for consistency of equations. Chap 10 Sec 10.3,
UNIT - V	Quadratic Forms: Quadratic Form - Matrix of a quadratic form - rank - classification of quadratic forms. Chap 7

TEXT BOOK :

1. Shanthi Narayan. And Mittal,P.K. (2000) A Text Book of Matrices, S.Chand & Co, New Delhi

REFERENCE BOOKS :

1. Vasishtha, A.R. (1992) Matrices, Krishna Prakashan, Meerut.
2. Gentle, J.E. (2007) Matrix Algebra Theory, Computations, and Applications in Statistics, Springer, New York. Richard Bronson.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcomes	Course Outcome	Knowledge Level
CO1	Recall the basic concepts of matrices	**K1**
CO2	Acquire the knowledge about rank of the matrix	**K2**
CO3	Apply Cayley Hamilton theorem for finding the inverse of the matrix and higher power of matrix.	**K3**
CO4	Classify the consistency of system of linear equations.	**K4**
CO5	Develop the knowledge about matrix of quadratic forms	**K2**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program specific outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	-	-	1	-	-	1	-	2	**1.0**
CO2	3	3	2	-	1	-	-	1	-	2	**1.2**
CO3	3	3	-	-	1	-	-	1	-	2	**1.0**
CO4	3	3	-	-	1	-	-	1	-	2	**1.0**
CO5	3	3	2	-	1	-	-	1	-	2	**1.2**
							Mean Overall Score				**1.1**

Result: The core for this course is 1.1 (Low relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

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COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT : 3	**COURSE CODE: U21ST2C2P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – II SEMESTER - CORE COURSE - II

(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL COMPUTING LAB – I (USING EXCEL) (BASED ON CORE COURSE I AND II)

COURSE OBJECTIVES :

To make the Students to:

1. Compute the various statistical measures using EXCEL package.
2. Develop the Data Analysis and Data Visualization skill.

UNIT - I	Diagrammatic and Graphical representation of data.
UNIT - II	Measures of Central tendency.
UNIT - III	Measures of Dispersion, Skewness and Kurtosis.
UNIT - IV	Correlation and Regression.
UNIT - V	Probability, Permutation.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Represent statistical data as diagrams and graphs and interpret using excel.	**K4**
CO2	Solve problems and to interpret the results of Descriptive statistics in real life using excel.	**K4**
CO3	Solve problems and to understand the probability in real life using excel.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	3	2	3	3	3	-	3	3	**2.6**
CO2	3	3	3	2	3	3	3	-	3	3	**2.6**
CO3	3	3	3	2	3	3	3	-	3	3	**2.6**
							Mean Overall Score				**2.6**

Result: The core for this course is 2.6 (High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST2C3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – II SEMESTER - CORE COURSE - III
(For the candidates admitted from the year 2021-22 onwards)

PROBABILITY THEORY

COURSE OBJECTIVES :

To make the Students to:

1. Understand the basic concepts and definitions of probability.
2. Learn to types of random variables and its functions.
3. Able to solve the basic problems in probability.
4. Able to obtain the mathematical expectation and moment generating function.

UNIT - I	Probability: Sample space - Events - algebraic operations on events. Definitions - Classical Probability, Empirical Probability, Axiomatic approach to probability - Independent events - Conditional probability - Addition and Multiplication theorems of probability - Bayes Theorem.
UNIT - II	Concept of Random Variables - Discrete random variable, continuous random variables, probability mass function - Probability density function. Distribution function -Properties of distribution function.
UNIT - III	Multiple Random Variables**:** Joint, marginal and conditional distributions - independence of random variables -Transformation of random variables (one and two dimensional) and determination of their distributions..
UNIT - IV	Mathematical Expectation: Expectation - Properties, Cauchy-Schwartz inequality, conditional expectation and conditional variance - theorems on expectation and conditional expectation. Moment generating function, characteristic function, probability generating function and their properties. - Inversion and Uniqueness theorem - statement only.
UNIT - V	Limit Theorems: Chebychev's Inequality and applications-Markov inequality - Convergence in probability, weak law of large numbers – Bernoulli's theorem, Khintchine's theorem (Statements only) - Central limit theorem (De - Moivre and Levy - Lindeberg Levy theorem).

TEXT BOOK :

1. GUPTA S.C., and KAPOOR V.K., (2004). "FUNDAMENTAL OF MATHEMATICAL STATISTICS*"* (11th –edition), Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS :

1. Dudewicz, E.J. and Mishra, S.N. Introduction to Mathematical Statistics, John Wiley, 1988
2. Hogg, R.V. and Craig, A.T.: Introduction to Mathematical Statistics, Prentice Hall, England, 5th Ed, 1999.
3. Marek, Fisz, (1961). "**PROBABILITY THEORY AND MATHEMATICAL STATISTICS"**, John Wiley and Sons. .

NOTE: Question should be 80% Theory and 20% Problems

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcomes	Course Outcome	Knowledge Level
CO1	Enable the students to understand and study random phenomena mathematically.	**K2**
CO2	To understand the concepts and to compute the probability, random variables and their applications in real life.	**K2**
CO3	To understand the applications of Moment Generating Functions, Characteristics Function, Uniqueness and Inversion theorems.	**K3**
CO4	To know about limit theorems and their applications and chebychev's inequality to real life problems.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	2	2	1	3	3	3	2	2	3	**2.4**
CO2	3	3	2	1	3	3	3	2	2	3	**2.4**
CO3	3	3	2	1	3	3	3	2	2	3	**2.4**
CO4	3	3	2	1	3	3	3	2	2	3	**2.4**
							Mean Overall Score				**2.4**

Result: The core for this course is 2.6 (High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3 **COURSE CODE: U21ST2A2P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS - II SEMESTER - FIRST ALLIED COURSE – II
(For the candidates admitted from the year 2021-22 onwards)

MATHEMATICS FOR STATISTICS – II (REAL ANALYSIS)

COURSE OBJECTIVES :

To make the Students to:

1. Know the concepts of set theory, Sequences and series.
2. Know the concepts and application of different tests.
3. Know the concepts and application of different theorems on differentiation.
4. Know the concepts and application of different theorems on integration.

UNIT - I	Set Theory: Operations on sets, Count ability, Real number, Least Upper Bound, Greatest Lower Bound, Set of real numbers, limits, Open and Closed sets.
UNIT - II	Sequences: Definition of Sequence, Limit of a sequence, Convergent and Divergent sequences, Bounded and Monotone sequences, Limit Infimum, Limit Supremum, Cauchy sequences, sum ability of sequences.
UNIT - III	Series: Series of real numbers. Convergence and divergence-series with nonnegative terms-comparison test-D'Alembert's ratio test- Cauchy's root test. Alternating series-conditional convergence- absolute convergence-Leibnitz test.
UNIT - IV	Differentiation: Limit of a function of a single variable, Continuity properties of a continuous function in a closed interval, Derivatives, Rolle's Theorem, Mean value theorem, Taylor's theorem.
UNIT - V	Integration: Concept of Riemann Integral, Sufficient condition for Riemann interg ability, Darboux theorem, Fundamental theorem, First mean value theorem - Improper Riemann integrals. Beta and Gamma Integrals.

TEXT BOOKS:

1. Arora, S. (1988) Real Analysis. Satya Prakashan Mandir, New Delhi.
2. Shanthi Narayan. (2003) Elements of Real Analysis, S. Chand & Co, New Delhi.

REFERENCE BOOK :

1. Walter Rudin, (2016), Principles of Mathematical Analysis, Fourteen reprints McGraw-Hill, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Learn the concept of convergence and limits and it apply to sequences, series, differentiation and integration.	**K2**
CO2	Classify, formulate and solve of a problems by the execution variety of proof techniques.	**K3**
CO3	Apply critical thinking skills to solve problems that can be modelled mathematically.	**K3**
CO4	Analyze how abstract ideas and rigorous methods in real analysis can be applied to practical problem.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	2	2	1	3	2	2	-	-	3	**1.8**
CO2	3	2	2	1	3	3	3	-	-	3	**2.0**
CO3	3	2	2	1	3	3	3	-	-	3	**2.0**
CO4	3	2	2	1	3	3	3	-	-	3	**2.0**
							Mean Overall Score				**2.0**

Result: The Matrix score of this Course is 2.0(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3 **COURSE CODE: U21ST2A3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – II SEMESTER - FIRST ALLIED COURSE – III

(For the candidates admitted from the year 2021-22 onwards)

MATHEMATICS FOR STATISTICS – III (NUMERICAL ANALYSIS)

COURSE OBJECTIVES :

To make the Students to:

1. To learn the knowledge about an algebraic and transcendental equations.
2. Develop the students for solving the problems by using various methods.

UNIT - I	**Solutions of equations:** Bi-section, false position, Horner's and Newton–Raphson methods -Solving of simultaneous linear equations by Gauss elimination method. **Chap 2 Sec 2.2, 2.3, 2.12.2, 6.3.2**
UNIT - II	**Operators and Differences**: Symbolic Operators – E, Δ, δ and ∇ their relationship and their role in difference tables - Central, forward, backward and divided differences - differences of polynomials. **Chap 3 Sec 3.3.1 - 3.3.4, 3.5**
UNIT - III	**Interpolation:** Problem of interpolation - with equal and unequal intervals - Formulae for forward and backward interpolation - Newton-Gregory, Gauss, Stirling, Everitt, Lagrange's methods of interpolation. **Chap 3 Sec 3.6, 3.7.1, 3.7.2, 3.7.4, 3.9.1**
UNIT - IV	**Numerical differentiation:** Numerical differentiation - Errors in Numerical Differentiation-Differentiation Formulae with function values- maxima and minima of a Tabulated function - numerical problems. Runge kutta method, Eulers Methods and Taylor's series. **Chap 6 Sec 6.2,6.2.1,,6.2.3,6.3** **Chap 8 Sec 8.2,8.4,8.5**
UNIT - V	**Numerical Integration:** Numerical integration: Quadrature formulae. Trapezoidal rule. Simpson's one-third rule - Simpson's three-eight rule. **Chap6 sec6.4,6.4.1,6.4.2,6.4.3**

TEXT BOOK:

1. Sastry, S. S. (1993) Introductory Methods of Numerical Analysis, PHI learning, New Delhi.

REFERENCE BOOKS:

1. Balasubramaniam,P and Venkatraman, M.K. (1972) Numerical Mathematics, Part I and II, Rochouse and Sons, New Delhi.
2. Saxena, H.C. (1972) Finite differences, S. Chand & Co, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Acquire the knowledge about different types of operators.	**K1**
CO2	Determine the polynomial by using interpolations with equal and unequal intervals.	**K2**
CO3	Get exposed to the basic concepts of algebraic and transcendental equations.	**K3**
CO4	Train the students to calculate numerical differentiation.	**K4**
CO5	Find an approximate value of the given integrals by using various methods.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	1	-	2	1	1	1	1	2	**1.4**
CO2	3	2	1	-	2	2	2	1	1	3	**1.7**
CO3	3	1	1	-	2	2	2	1	1	3	**1.6**
CO4	3	2	1	-	2	2	2	1	1	3	**1.7**
CO5	3	2	1	-	2	2	2	1	1	3	**1.7**
							Mean Overall Score				**1.6**

Result: (The Matrix score of this Course is 1.6(Moderate relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST3C4**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – III SEMESTER - CORE COURSE – IV

(For the candidates admitted from the year 2021-22 onwards)

DISTRIBUTION THEORY

COURSE OBJECTIVES :

To make the Students to:

1. Study the various distributions in statistics.
2. Learn different types of sampling distributions.
3. Expose the real-life applications of Discrete, Continuous and sampling Distributions.
4. Apply the distributions in different real life problems.

UNIT - I	Discrete Distributions: Bernoulli Distribution, Binomial distribution, Poisson distribution, Geometric distribution, Negative binomial distribution. Moments, Moment generating function, Characteristic function, Probability Generating Function. Recurrence relations for probabilities,
UNIT - II	Hyper geometric distribution, Multinomial distribution and Discrete Uniform Distribution – Moments, Moment generating function and Characteristic function.
UNIT - III	Continuous Distributions: Uniform, Normal Distribution and its properties -, Exponential distribution - Moments, Moment generating function and Characteristic function.
UNIT - IV	Gamma distribution, Beta distribution of First kind and second kind - Moments, Moment generating function and Characteristic function.
UNIT - V	Sampling Distributions: Student's t, Chi-square and F-distributions (derivation, properties and interrelationships).

TEXT BOOK:

1. GUPTA S.C., and KAPOOR V.K., (2004). "FUNDAMENTAL OF MATHEMATICAL STATISTICS*"* (11th - edition), Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. Hogg, R.V. and Craig, A. G. (1978) Introduction to Mathematical Statistics, MacMillan, London.
2. Goon, A.M. Gupta M.K. and Das Gupta, B. (1993) Fundamentals of Statistics Vol. I. World press, Kolkata.
3. Rohatgi, V.K and Saleh A. K MD.E. (2001)An Introduction to Probability and Statistics, Wiley, India.

NOTE: Question should be Theory only.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Get essential knowledge on different Discrete, Continuous and sampling Distributions and their Applications.	**K2**
CO2	expose to the real-life applications of Discrete, Continuous and sampling Distributions	**K3**
CO3	Understand relationship between t, chi-square and F distributions.	**K2**
CO4	Identify a suitable distribution for the given data.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	1	1	3	2	2	2	-	2	**1.9**
CO2	3	3	1	1	3	3	3	2	-	3	**2.2**
CO3	3	3	1	1	3	2	2	2	-	2	**1.9**
CO4	3	3	1	1	3	3	3	2	-	3	**2.2**
							Mean Overall Score				**2.1**

Result: The core for this course is 2.1(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: G. VANITHASRI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4	COURSE CODE: U21ST3A1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – III SEMESTER - SECOND ALLIED COURSE - I
(For the candidates admitted from the year 2021-22 onwards)

ALLIED - R - PROGRAMMING

COURSE OBJECTIVES :

To make the Students:

1. To impart efficient Data Handling Techniques.
2. To equip students to Statistical Programming Skills based on real life examples and datasets.
3. Frame frequency distribution, statistical diagrams and graphs using R.
4. Compute Programming skills and interpret the results of statistics using R.
5. Compute and interpret the results of probability distributions using R.

UNIT - I	Introduction to R - Using the help facility. R data types and objects, reading and writing data import and export. Data structures: vectors, matrices, lists and data frames. Built-in data-Reading data from other sources - Merging data across data sources. Control structures: functions, scoping rules, dates and times.
UNIT - II	Grouping, loops and conditional execution - Ordered and unordered factors - Classes and methods - GRAPHICS: Graphics With R - Graphics Functions – Saving, Storing and Retrieving Work - Diagrammatic Representation of Data - Graphical Representation of Data - Measures of Central Tendency and Dispersion.
UNIT - III	Arrays and matrices - Vector matrix operations - matrix operations - addition, subtraction, multiplication, linear equations and Eigen values, matrix decomposition - lu, qr, and svd and Matrix Determinant - Inverse -Transpose - Trace, basis of matrix, rank of a matrix.
UNIT - IV	Dealing with Missing values - Data Cleaning and Transforming - Exploring and Visualizing – Writing your own functions - Statistical models in R. **CORRELATION:** Introduction - Scatter Diagram- Coefficient Correlation and its Properties - Computation of Correlation Coefficient - Inference Procedures for Correlation Coefficient. **REGRESSION ANALYSIS**: Linear Regression - Linear Regression Model - Model Assumptions - Linear Calibration - Inference Procedures for Simple Linear Model - Validation of Linear Regression Model.
UNIT - V	**PROBABLITY AND PROBABILITY DISTRIBUTIONS**: Discrete Distributions and Continuous Distributions-Fittings of distributions.

TEXT BOOKS:

1. Sudha G. Purohit, Sharad D. Gore, Shailaja R. Deshmukh, "Statistics Using R", Narosa, Publishing House Pvt. Ltd.. 2nd Ed., 2015.Books for Reference
2. John Maindonald and John Braun. "Data Analysis and Graphics Using R". Cambridge University Press, Cambridge, 2003.
3. Brian Everitt and TorstenHothorn. "A Handbook of Statistical Analyses Using R". Chapman & Hall/CRC, Boca Raton, FL, 2006. ISBN 1-584-88539-4.

REFERENCE BOOKS:

1. Rndall E.Schumacker, Learning Statistics, Sage Publication.
2. Jared P.Lander, R for Everyone ,Pearson Education

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Impart efficient Data Handling Techniques.	**K2**
CO2	Competent in Statistical Programming Skills in R	**K3**
CO3	Proficient in Graphical representation and Statistical Program using R	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	2	3	2	3	3	2	3	**2.6**
CO2	3	3	2	2	3	3	3	3	2	3	**2.7**
CO3	3	3	2	2	3	3	3	3	2	3	**2.7**
							Mean Overall Score				**2.67**

Result: The core for this course is 2.67(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4	**COURSE CODE: U21ST4C5P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – IV SEMESTER - CORE COURSE - V

(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL COMPUTING LAB - II

COURES OBJECTIVES:

To make the Students to:

1. Compute the various statistical measures in distributions.
2. Construct confidence interval for different parameters.

UNIT - I	Binomial, Poisson, Geometric distribution, Negative binomial distribution. Fitting of Binomial and Poisson.
UNIT - II	Normal, Hyper geometric distribution, Fitting of Normal distribution.
UNIT - III	Method of maximum likelihood, method of moments.
UNIT - IV	Construction of Confidence intervals for mean(s), variance(s) and proportion(s) based on Normal.
UNIT - V	Construction of Confidence intervals for mean(s), variance(s) and proportion(s) based on t, Chi-square and F distributions.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	To solve problems and to interpret the results of Distributions in real life.	**K4**
CO2	To solve problems and to interpret the statistical Inference in real life.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	3	3	3	2	3	**2.6**
CO2	3	3	2	1	3	3	3	3	2	3	**2.6**
							Mean Overall Score				**2.6**

Result: The core for this course is 2.6(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST4C6**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – IV SEMESTER - CORE COURSE - VI
(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL ESTIMATION THEORY

COURSE OBJECTIVES :

To make the Students to:

1. Study the concepts of estimator and their properties.
2. Learn different methods of Estimation.
3. Learn and apply the different theorems in problems of estimation.
4. Apply the concepts of interval estimation in real-life problems

Understand the concepts of Bayesian estimation.

UNIT - I	Point estimation: Estimator - Properties –Unbiasedness, Consistency, - invariance property of consistent estimators - sufficient conditions for consistency. Efficiency - sufficient statistics - most efficient estimators of minimum variance unbiased estimators Neyman-Fisher Factorization theorem.(Statement Only)
UNIT - II	Unbiased Estimation: Minimum variance unbiased estimators, Cramer - Rao Inequality, Minimum Variance Unbiased (MVU) and Black - wellisation- Rao-Blackwell theorem .
UNIT - III	Methods of Estimation - Methods of Maximum likelihood and moments - Properties of estimators obtained by these methods –Method of minimum Chi-square and modified minimum Chi-square. Method of Least Squares.
UNIT - IV	Interval Estimation: Interval estimator, Interval confidence limits, pivotal quantity. Confidence Interval for proportion(s), mean(s), variance(s) based on normal, Chi-square, Student's t and F distributions.
UNIT - V	Bayesian Estimation: Concept of Prior information, Non-informative prior, posterior distribution and Bayes estimator under squared error loss function.

TEXT BOOK :

1. GUPTA S.C., and KAPOOR V.K., (2004). "FUNDAMENTAL OF MATHEMATICAL STATISTICS*"* (11th –edition), Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. Hogg, R.V. and Craig, A. G. (1978) Introduction to Mathematical Statistics, MacMillan, London.
2. Mood, A.M Graybill, F.A. and Boes,D.C(1974) Introduction to Theory of Statistics, Tata McGraw Hill, New Delhi
3. Rohatgi, V.K and Saleh A. K MD.E. (2001)An Introduction to Probability and Statistics, Wiley, India. .

NOTE: Question should be Theory only.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

COURSE OUTCOMES:
By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand the concepts of estimation and their properties.	**K2**
CO2	Find estimate using different methods of estimation.	**K3**
CO3	Solve the problems in interval estimation using various parameters.	**K3**
CO4	Understand the concepts of Bayesian estimation.	**K2**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	1	1	3	2	2	2	-	3	**2.0**
CO2	3	3	2	1	3	3	3	2	-	3	**2.3**
CO3	3	3	2	1	3	3	3	2	-	3	**2.3**
CO4	3	3	1	1	3	2	2	2	-	3	**2.0**
							Mean Overall Score				**2.2**

Result: The core for this course is 2.2(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value scaling

Mean Score of Cos= $\frac{\textbf{Total of Values}}{\textbf{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\textbf{Total of Mean Scores}}{\textbf{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3	COURSE CODE: U21ST4A2P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – IV SEMESTER - SECOND ALLIED COURSE - II

(For the candidates admitted from the year 2021-22 onwards)

ALLLIED PRACTICAL - R - PROGRAMMING

COURSE OBJECTIVES :

To make the Students to:

1. To train the students in using R Language for solving basic statistical Problems.
2. To explain the practical utility of R in real life situations.

UNIT - I	Formation of discrete and continuous frequency distributions. Graphs and diagrams: Pie, bar, line and scatter diagrams - Histogram and Normal probability plot. Box plot, Waterfall plot, and Mean+ Error plot.
UNIT - II	Computation of Measures of Central tendency, Measures of Dispersion, Skewness and Kurtosis.
UNIT - III	Computation of Simple Correlation and Regression Coefficients.
UNIT - IV	Curve estimation, Calculation of Probabilities under various distributions.
UNIT - V	Construction of Confidence intervals for mean(s), variance(s) and proportion(s) based on Normal, t, Chi-square and F distributions.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Represent statistical data as diagrams and graphs and interpret in R-Programming.	**K4**
CO2	To find solution and to interpret the results of Descriptive statistics in real life using R-Programming.	**K4**
CO3	To solve problems and to understand the probability in real life using R-Programming.	**K4**
CO4	To interpret results of confidence intervals using R-programming.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	3	3	3	1	3	**2.5**
CO2	3	3	2	1	3	3	3	3	1	3	**2.5**
CO3	3	3	2	1	3	3	3	3	1	3	**2.5**
CO4	3	3	2	1	3	3	3	3	1	3	**2.5**
							Mean Overall Score				**2.5**

Result: The core for this course is 2.2(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **COURSE CODE: U21ST4A3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – IV SEMESTER - SECOND ALLIED COURSE - III
(For the candidates admitted from the year 2021-22 onwards)

OPERATIONS RESEARCH

COURSE OBJECTIVES:

To make the Students:

1. To gain knowledge about various optimization techniques.
2. Learn to construct a real life problem to LPP and to solve the LPP by various techniques.
3. Understand the concepts of maximize the profit and minimize cost to the company and industries.
4. To study various game theory techniques to apply in business situations.
   To learn to draw network to completing a project.

UNIT - I	Introduction - Origin - Nature of OR - Structure - Characteristics - OR in Decision making - Models in OR - Phase of OR - Uses and Limitations of OR - LPP- Mathematical formulation of LPP - Graphical Method.LPP - Standard form of LPP - Maximization - Minimization - Simplex method.
UNIT - II	Artificial variable technique - Two-Phase Method -Big-M method. Duality in LPP - Formulation of Dual LPP - Primal - Dual relationship - Solving LPP using Dual concepts - Dual Simplex Method.
UNIT - III	Transportation problem - Balanced, Unbalanced T.P. - Initial basic feasible solution - North West Corner Rule - Row Minima - Column Minima - Matrix Minima (LCM) - Vogel's Approximation Method - Optimality Test - MODI Method. Assignment problem - Introduction - Balanced - Unbalanced - Maximization - Minimization - Hungarien Method.
UNIT - IV	Introduction - definition - pay-off - types of games - the maximin - minimax principles Saddle Point - Game with Saddle Point - without saddle point - mixed strategies - 2 x 2 games - graphical method for 2 x n or m x 2 games – dominance property - Simple problems.
UNIT - V	Network analysis - Basic concepts - Constraints in network - Construction of network - Critical path method (CPM) - Program Evaluation Review Technique (PERT) - simple Problems.

TEXT BOOK :

1. KANTI SWARUP, P.K.GUPTA**,** and MANMOHN (1980) – "**OPERATIONS RESEARCH**", Sultan Chand and sons, New Delhi.

REFERENCE BOOKS:

1. J. K.SHARMA (1997), "**OPERATIONS RESEARCH AND APPLICATION**", McMillan and Company, New Delhi.
2. Taha, H.A**: "OPERATIONS RESEARCH-AN INTRODUCTION",** PHI, 1998.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Gains knowledge about various optimization techniques.	**K2**
CO2	Construct LPP and solve the problem by various techniques.	**K3**
CO3	Apply the techniques to Maximize the profit and minimize the cost of the company and industries.	**K3**
CO4	Apply various techniques to solve the business situations.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	3	3	2	2	3	**2.5**
CO2	3	3	2	1	3	3	3	2	2	3	**2.5**
CO3	3	3	2	1	3	3	3	2	2	3	**2.5**
CO4	3	3	2	1	3	3	3	2	2	3	**2.5**
							Mean Overall Score				**2.5**

Result: The core for this course is 2.5(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3 **COURSE CODE: U21ST4S1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS - IV SEMESTER - SKILL BASED ELECTIVE - I

(For the candidates admitted from the year 2021-22 onwards)

ACTUARIAL STATISTICS

COURSE OBJECTIVES :

To make the Students:

1. Understand concepts of generalized cash-flow model to describe financial transactions.
2. Learn different types of insurance contracts.
3. Learn to take into account the time value of money using the concepts of compound interest and discounting.
   To solve problems of simple interest, compound interest, present value, discount rates, Nominal rates, annuities.

UNIT - I	Cash Flow Models: Cash Flow Process - Examples of Cash Flow Scenarios -Zero Coupon Bond , Fixed Interest Securities, Index Linked Securities, Cash on Deposit, Equity, Annuity, An Interest only Loan, Repayment Loan.
UNIT - II	Insurance contracts - Pure endowment - An endowment assurance -Term assurance- Contingent annuity - Car insurance policy - Health cash plans.
UNIT - III	Time value of money - Interest - Simple Interest, Compound Interest, accumulation factors - The principle of consistency.
UNIT - IV	Present Values - Discount rates - simple discount Compound discount - Effective rates of interest and discount - Equivalent rates.
UNIT - V	Interest Rates: Nominal Rates - Nominal rates of Interest and discount - accumulating and discounting using nominal interest and discount rates.

TEXT BOOK :

1. Bower, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A., & Nesbitt, C. J. (1997). Actuarial Mathematics.

REFERENCE BOOKS:

1. Promislow, S. D. (2014). Fundamentals of Actuarial Mathematics. John Wiley & Sons, Act Ed Study Material.
2. Actuarial Mathematics. Bowers, Newton L et al. - 2nd ed. - Society of Actuaries, 1997.xxvi, 753 pages. ISBN: 0 938959 46 8.
3. Dr P. Mariappan, Business Mathematics, Pearson Indian Education Service Pvt. Ltd., 2015; ISBN: 978-93-325-3634-0

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand concepts of generalized cash-flow model to describe financial transactions.	**K2**
CO2	Learns different types of insurance contracts.	**K2**
CO3	Learn to take into account the time value of money using the concepts of compound interest and discounting.	**K2**
CO4	solve problems of simple interest, compound interest, present value, discount rates, Nominal rates, annuities.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	2	1	3	2	2	1	1	2	**1.9**
CO2	3	2	2	1	3	2	2	1	1	3	**2.0**
CO3	2	2	2	1	3	2	2	1	1	3	**1.9**
CO4	2	2	2	1	3	3	3	1	1	3	**2.1**
							Mean Overall Score				**2.0**

Result: The core for this course is 2.0(Medium relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST5C7**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – V SEMESTER - CORE COURSE - VII
(For the candidates admitted from the year 2021-22 onwards)

TESTING OF STATISTICAL HYPOTHESIS

COURSE OBJECTIVES :

To make the Students to:

1. Learn various parametric and non-parametric tests.
2. Frame the hypothesis.
3. Learn various powerful test and applications of Nyman-person - lemma.
   Test and interpret the Hypothesis for large and small samples with various parameters.

UNIT - I	Statistical Hypothesis - Simple and Composite hypotheses - Null and Alternative Hypotheses - Critical region - Type-I and Type-II errors - level of significance, size and Power of test - Most powerful test - steps involved in testing of hypothesis. - Nyman-Pearson fundamental Lemma.
UNIT - II	Large Sample Tests - Sampling distribution, standard error. Large sample tests concerning mean, variance, proportion- difference between means, difference between proportions.
UNIT - III	Small sample Tests: Tests based on t, F and Chi - distributions for means, difference between means, variance, Ratio of variances. Tests for co - efficient of correlation, regression coefficient. Chi - square Tests: Tests for association, independence and goodness of fit. .
UNIT - IV	Non-Parametric Tests - advantages and drawbacks of NP methods over Parametric methods - Sign, Wilcoxon's Signed rank test and Runs test for one sample problems. Median test, Mann - Whitney test for two sample problems - Kruskal - Wallis test.
UNIT - V	Likelihood ratio test - Tests for mean and variance of normal populations - Tests for equality of means of two normal populations - Test for equality of variances of two normal populations.

TEXT BOOK :

1. GUPTA S.C., and KAPOOR V.K., (2004). "FUNDAMENTAL OF MATHEMATICAL STATISTICS" (11th –edition), Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS :

1. Hogg, R.V. and Craig, A. G. (1978) Introduction to Mathematical Statistics, MacMillan, London. Mood, A.M Graybill, F.A. and Boes,D.C(1974) Introduction to Theory of Statistics, Tata McGraw Hill, New Delhi
2. Rohatgi, V.K and Saleh A. K MD.E. (2001)An Introduction to Probability and Statistics, Wiley, India.

NOTE: Question should be Theory only.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcomes	Course Outcome	Knowledge Level
CO1	Understands the concepts of various powerful test and applications of Nyman-person - lemma	**K2**
CO2	Apply various parametric and non-parametric tests in real - life situations.	**K3**
CO3	Able to frame the hypothesis for real - life problems.	**K6**
CO4	Skilled to test the Hypothesis and interpret for large and small samples with various parameters.	**K5**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	2	2	-	-	3	**1.9**
CO2	3	3	2	1	3	3	3	2	2	3	**2.5**
CO3	3	3	2	1	3	3	3	-	-	3	**2.1**
CO4	3	3	2	1	3	3	3	2	2	3	**2.5**
							Mean Overall Score				**2.25**

Result: The Matrix score of this Course is 2.25 (High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **COURSE CODE: U21ST5C8**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – V SEMESTER - CORE COURSE - VIII

(For the candidates admitted from the year 2021-22 onwards)

SAMPLING THEORY

COURSE OBJECTIVES :

To make the Students to:

1. Learn concepts and different types of sampling.
2. Conduct sample survey.
3. Solve problems of different types of sampling.
4. Compare the efficiency of different sampling techniques.

UNIT - I	Concept of sampling and population - parameters and statistics – sampling Distributions - principal steps in a sample survey - sampling and non sampling errors - uses and limitations.
UNIT - II	Simple random sampling - Notations and terminology - SRS with and without replacement - unbiased estimate of mean and variance - merits and demerits of SRS.
UNIT - III	Stratified random sampling - Notations and terminology - unbiased estimate of population mean and its variance - allocation of sample size - proportional and optimum allocation - cost function - relative precision of stratified random sampling and simple random sampling.
UNIT - IV	Systematic sampling - Notations and terminology - unbiased estimate of mean and variance - comparison of SRS, stratified random sampling and systematic sampling - Merits and Demerits of systematic samplings.
UNIT - V	Concepts of Multistage Sampling - cluster sampling - Quota Sampling - Problems related to simple random sampling - systematic and stratified random sampling.

TEXT BOOK :

1. GUPTA S.C., and KAPOOR V.K., (2004). "FUNDAMENTAL OF MATHEMATICAL STATISTICS*"* (11th - edition), Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. W.G. COCHRAN (1985): "**SAMPLING TECHNIQUES**", Wiley Eastern Ltd, New Delhi.
2. PARIMAL MUKHOPADHYAY (2012). "**THEORY AND METHOD OF SURVEY SAMPLING**", 4th edition (EEE) PHI learning private limited, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcomes	Course Outcome	Knowledge Level
CO1	Apply the sampling procedures to different situations.	**K3**
CO2	Equip with Sampling Techniques for conducting sample surveys.	**K4**
CO3	Solve problems related to different types of sampling.	**K3**
CO4	Compare the efficiency of various estimation strategies resulting from different sampling techniques.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	2	1	3	3	3	1	1	3	**2.3**
CO2	3	3	2	1	3	2	2	-	-	3	**2.0**
CO3	3	3	1	1	3	3	3	2	2	3	**2.4**
CO4	3	3	2	1	3	3	3	2	2	3	**2.5**
							Mean Overall Score				**2.3**

Result: The Matrix score of this Course is 2.3(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: G. VANITHASRI

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4 **COURSE CODE: U21ST5C9**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – V SEMESTER - CORE COURSE - IX
(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL QUALITY CONTROL

COURSE OBJECTIVES :

To make the Students to:

1. Know the usage of statistical quality control in industries.
2. Interpret the quality control using various charts.
3. Know various sampling Inspection plans for quality Control.

UNIT - I	Statistical Quality Control (SQC) - definition - classification - basis of SQC - Chance and Assignable Causes - Benefits of SQC - Process and Product Control - Control Charts - 3σ- Control limits - tools for SQC.
UNIT - II	Control Charts for Variables - steps for $\bar{X}$ and R Charts - control limits for charts and R-charts – criterion for detecting lack of control in charts $\bar{X}$ and R charts. Interpretation of $\bar{X}$ charts and R charts. Control charts for standard deviation. Problems.
UNIT - III	Control charts for attributes - types - p chart and d chart - definition, mean and Variance. Three methods of *p* and *d* charts for variable sample size. Interpretation of *p* chart. Control charts for number of defectives per unit (c - chart) - definition - limits, mean and variance, c chart for variable sample size or u - chart - application of c - chart.
UNIT - IV	Natural Tolerance Limits and specification limits - interpretation - modified control limits - acceptance sampling by attributes. Concepts of AQL, LTPD, Process Average Fraction Defective (p), consumer's risk, producer's risk and AOQL. O.C. curve.
UNIT - V	ASN - definition, Sampling Inspection Plan for Attributes - Single Sampling Plan, determination of n and c. Concepts of Double Sampling Plan - procedures and flow chart. Single Sampling Plan VS Double Sampling Plan.

TEXT BOOK :

1. V.K.KAPOOR and S.C.GUPTA, "**FUNDAMENTALS OF APPLIED STATISTICS**", Sulthan Chand and Sons, New Delhi. Reprint 2013.

REFERENCE BOOKS :

1. M.MAHAJAN (2001), "**STATISTICAL QUALITY CONTROL**", Dhanpat Rai & co (p) Ltd., Delhi.
2. EUGENE L. GRANT and RICHARD S. LEAVENWORTH, "**STATISTICAL QUALITY CONTROL**", Tata McGraw Hill Education Private Limited, New Delhi.
3. DOUGLAS C. MONTOGOMERY: "**STATISTICAL QUALITY CONTROL: A MODERN INTRODUCTION**" (Sixth Edition), John Wiley & Sons, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Make out the usage of statistical quality control in industries.	**K3**
CO2	Apply various sampling Inspection plans for quality Control	**K3**
CO3	Interpret the quality control using various charts	**K5**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	1	2	3	3	2	-	-	-	**1.7**
CO2	3	3	2	-	3	3	3	2	2	3	**2.4**
CO3	3	3	3	2	3	3	3	2	2	3	**2.7**
							Mean Overall Score				**2.27**

Result: The Matrix score of this Course is 2.27(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 4	**COURSE CODE: U21ST5C10P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – V SEMESTER - CORE COURSE – X

(For the candidates admitted from the year 2021-22 onwards)

(Based on Core Course VII, VIII and IX)

STATISTICAL COMPUTING LAB – III

COURSE OBJECTIVES :

To make the Students to:

1. Compute the various statistical measures in sampling and statistical quality control.
2. To test the hypothesis for large and small samples using various parameters.
3. To test the hypothesis of non-parametric test.

UNIT - I	Simple Random Sampling:(with and without replacement).Estimation of y, V(y), SE (y). Stratified Random Sampling: Estimation of $\bar{Y}_{st}$, V ($\bar{Y}_{st}$). Allocation Techniques: Equal, proportional, Nyman's Optimum. Estimation of V ($\bar{Y}_{st}$) under these allocation techniques and their comparison. Systematic Sampling: Estimation of $\bar{Y}\,sy$, V ($\bar{Y}\,sy$).
UNIT - II	Control Charts: $\overline{X}$ and R, p, np and c charts. Determination of OC curve for Single sampling plan. Determination of ASN, ATI and OC curves for Double Sampling Plans. SPRT
UNIT - III	Test for Independence of attributes, Cross tabulation and Chi- square - test. Test for goodness of fit.
UNIT - IV	Tests of significance with regard to single mean, difference between two means, single proportion, difference between two proportions, variance, coefficient of correlation, regression coefficient (for Large and Small samples).
UNIT - V	Non-parametric tests: Sign test, Wilcoxon's Signed rank test, Median test, Run test, Mann-Whitney U test and Kruskal- Wallis test.

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Estimate and interpret the values for various sampling techniques using R-Programming.	**K4**
CO2	Interpret the results of various control charts using R-Programming.	**K4**
CO3	Interpret the test of significance of Parametric and non-parametric test using R-programming.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	3	3	3	2	3	**2.6**
CO2	3	3	2	1	3	3	3	3	2	3	**2.6**
CO3	3	3	2	1	3	3	3	3	2	3	**2.6**
							Mean Overall Score				**2.6**

Result: The Matrix score of this Course is 2.6(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST5E1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – V SEMESTER - ELECTIVE COURSE - I

(For the candidates admitted from the year 2021-22 onwards)

BIOSTATISTICAL AND SURVIVAL ANALYSIS

COURSE OBJECTIVES :

To make the Students to:

1. Learn different types of study design in clinical Trials.
2. Know the concepts of Diagnosis.
3. Learns different phases of clinical Trials.
4. Knows the basic concepts of survival analysis and life distributions.
5. Understands the concepts and applications of life table, failure rate, survival function, Kaplan estimator.

UNIT - I	Introduction to Study Designs - Different Types of Observational Studies - Experimental Studies. Epidemiology - Odds - Odds Ratio - Confidence Interval for Odds Ratio- Relative Risk.
UNIT - II	Chi-Square test: Diagnostic Procedures with Threshold model. Measuring the accuracy of diagnosis - Sensitivity, Specificity, ROC curve.
UNIT - III	Clinical Trials: Introduction - Different Phases of Clinical Trials - Purpose - Duration Cost - Drug Regulatory Bodies.
UNIT - IV	Survival Analysis: Concepts of time, Order and random Censoring, likelihood in these cases. Life distributions-Exponential, Gamma, Wei bull, Lognormal.
UNIT - V	Life tables, Failure rate, mean residual life and their elementary properties. Ageing classes and their properties, Bathtub Failure rate. Estimation of survival function-Kaplan-Meier Estimator.

TEXT BOOKS:

1. Dawson, Beth & Robert, G (2001) ; Basic & Clinical Biostatistics, Mcgraw-Hill
2. Miller, R G. (1981) Survival Analysis, Wiley, New York.
3. Friedman, L.M, Forbes, C.D, And Demats, D.L (TT): Fundamental Of Clinical Trials, Springer.

REFERENCE BOOKS:

1. Mathews, J.N.S. (2006): Introducing To Randomized Controlled Clinical Trials, Chapman And Hall.
2. Steven Diantadosi (2000): Clinical Trials – A Methodological Perspective, John Willey.
3. Cox, D R. and Oakes, D. (1984). Analysis of Survival Data, Chapman & Hall, New York.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Trained in different types of study design in clinical Trials.	**K2**
CO2	Measure the accuracy of Diagnosis.	**K3**
CO3	Be taught different phases of clinical Trials.	**K2**
CO4	Know the basic concepts of survival analysis and life distributions.	**K2**
CO5	Comprehend the concepts and applications of life table, failure rate, survival function, Kaplan estimator.	**K2**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	-	2	3	3	3	-	-	3	**2.0**
CO2	3	3	-	2	3	3	3	-	-	3	**2.0**
CO3	3	3	-	2	3	2	2	-	-	3	**1.8**
CO4	2	3	-	2	3	2	2	2	2	3	**2.1**
CO5	2	3	-	2	3	2	2	2	2	3	**2.1**
							Mean Overall Score				**2.0**

Result: The Matrix score of this Course is 2.0(Medium relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3 **COURSE CODE: U21ST5S2**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – V SEMESTER - SKILL BASED ELECTIVE - II
(For the candidates admitted from the year 2021-22 onwards)

DATA ANALYSIS USING PYTHON

COURSE OBJECTIVES :

To make the Students:

1. To learn the basis of Python language.
2. To interpret diagrammatic and graphical representation.
3. Learn to use statistical techniques in Python.

UNIT - I	Introduction to Python: Programming in Python - Input- output Functions - Comments in Python - Indentation - Tokens - Data types. Control Structure-Sequential Statement-Branching Statement-looping constructs-jump statements in Python.
UNIT - II	Functions - Types of Function - calling a Functions - Passing Parameters in Functions - function Arguments - Anonymous Functions - return Function - recursive functions. Strings - creating Strings - Accessing Characters in String - Modifying and deleting Strings - String Operators - String Formatting Operators - formatting Characters - Format () function - Built-in string functions. Membership Operators.
UNIT - III	Lists – Tuples - Dictionaries - Sets - Dictionary.
UNIT - IV	Python Object Oriented Overview of OOP - Defining classes - Creating Objects - Accessing attributes - class Methods - constructor and destructor in Python. - Public and Private Data members.
UNIT - V	Data Visualization: - Bar Charts - Line Charts - Scatter Plots. Statistical functions - Descriptive statistics, Dispersion, correlation and regression - simple problems using python.

TEXT BOOKS :

1. Python Programming: A modular approach by Pearson - Sheetal, Taneja
2. Fundamentals of Python –First Programs by Kenneth A. Lambert

REFERENCE BOOKS :

1. Python programming using problem solving approach - Reema Thareja - Oxford University press.
2. Python Crash Course - Eric Mathes - No starch press, San Francisco2.https://www.techbeamers.com/python-tutorial-step-by-step/#tutorial-list
3. Python Tutorial book from tutorialspoint.com
4. https://docs.python.org/3/tutorial/index.html

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand basis of Python language	**K2**
CO2	Interpret data in both diagrammatic and graphical representation	**K4**
CO3	Perform data analysis with statistical techniques using Python	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	2	3	2	1	-	2	2	2	-	3	**1.7**
CO2	3	3	2	2	1	3	3	3	-	3	**2.3**
CO3	3	3	2	2	1	3	3	3	-	3	**2.3**
							Mean Overall Score				**2.1**

Result: The Matrix score of this Course is 2.1(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3	COURSE CODE: U21ST5S3P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – V SEMESTER - SKILL BASED ELECTIVE - III

(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL ANALYSIS LAB

COURSE OBJECTIVES :

To make the Students to:

1. Compute the various statistical measures using python.
2. Test the hypothesis and interpret for large and small samples using various parameters using python.
3. Test the hypothesis and interpret non - parametric test using python.
4. Test the ANOVA and interpret using python.

UNIT - I	Diagrammatic and Graphical representation of data. Measures of Central tendency Measures of Dispersion, Correlation and Regression.
UNIT - II	Tests of significance with regard to single mean, difference between two means,single proportion, difference between two proportions, variance, coefficient of correlation, regression coefficient.
UNIT - III	ANOVA - One - way Classification - Two - way classification.
UNIT - IV	Test for Independence of attributes, Cross tabulation and Chi-square - test. Test for goodness of fit.
UNIT - V	Non-parametric tests: Sign test, Wilcoxon's Signed rank test, Median test, Runs test, Mann-Whitney U test and Kruskal- Wallis test.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Represent statistical data as diagrams and graphs and interpret using python.	**K4**
CO2	To find solution and to interpret the results of Descriptive statistics in real life using python.	**K4**
CO3	To solve problems and to understand the probability in real life using Python.	**K4**
CO4	To interpret results of confidence intervals using python.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate

Mapping Course Outcome with PO and POS

Course Outcome	Program Outcomes				Program Specific Outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	3	3	3	1	3	**2.5**
CO2	3	3	2	1	3	3	3	3	1	3	**2.5**
CO3	3	3	2	1	3	3	3	3	1	3	**2.5**
CO4	3	3	2	1	3	3	3	3	1	3	**2.5**
							Mean Overall Score				**2.5**

Result: The core for this course is 2.2(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

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CREDIT: 5 **COURSE CODE: U21ST6C11**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – VI SEMESTER - CORE COURSE - XI

(For the candidates admitted from the year 2021-22 onwards)

DESIGN OF EXPERIMENTS

COURSE OBJECTIVES :

To make the Students to:

1. Layout different designs and analysis of variance techniques in the field experiments.
2. Understand basic principles of Design of experiment.
3. Apply the various designs of experiments techniques to analysis the data relating to agriculture, biological sciences and industry.
4. understand and analysis the data based on different designs of factorial experiments.

UNIT - I	Analysis of Variance - meaning - one way classification two way classifications (without derivation) - Problems.
UNIT - II	Design of Experiment - meaning - terminology in experimental design - Principles - completely randomized Design (CRD) - analysis.
UNIT - III	Randomized Block Design (RBD) - analysis - estimating missing value in RBD - Latin Square Design (LSD) - analysis - efficiency of a LSD relative to RBD and CRD- missing value in LSD.
UNIT - IV	Missing plot Technique - meaning - Analysis of RBD and LSD with one and two missing Observation.
UNIT - V	Factorial Experiment - Definition - 2^2 , 2^3 and 3^2 factorial experiments - main effects and interaction - analysis - confounding –partial confounding (concepts only).

TEXT BOOK:

1. V.K.KAPOOR and S.C.GUPTA, "**FUNDAMENTALS OF APPLIED STATISTICS**", Sulthan Chand and Sons, New Delhi. Reprint 2013.

REFERENCE BOOK:

1. MONTGOMERY. D (1972): "**DESIGN OF EXPERIMENTS**", John Wiley and Sons.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome No.	Course Outcome	Knowledge Level
CO1	Layout of different designs and analysis of variance techniques in the field experiments.	**K3**
CO2	Understand basic principles of Design of experiment.	**K2**
CO3	apply the various designs of experiments techniques to analysis the data relating to agriculture, biological sciences and industry	**K3**
CO4	Analysis different designs of factorial experiments.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	1	3	3	3	-	-	3	**2.1**
CO2	3	3	1	-	3	2	3	-	-	3	**1.8**
CO3	3	3	2	1	3	3	3	2	2	3	**2.5**
CO4	3	3	2	1	3	3	3	2	2	3	**2.5**
							Mean Overall Score				**2.3**

Result: The Matrix score of this Course is 2.3(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

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CREDIT: 5 **COURSE CODE: U21ST6C12**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – VI SEMESTER - CORE COURSE - XII

(For the candidates admitted from the year 2021-22 onwards)

STOCHASTIC PROCESS

COURSE OBJECTIVES :

To make the Students to:

1. Understand basics of stochastic models and its applications.
2. Identify the situations of stochastic modeling.
3. Understand the concepts and application of morkov chain.
4. Solve problems in Markov chain.

UNIT - I	Definition and classification of Stochastic Processes: Basic Concepts, Definition and examples of stochastic process, classification of general stochastic processes into discrete and continuous time, discrete and continuous state spaces, types of stochastic processes, elementary problems.
UNIT - II	Markov chains: Definition and examples of Markov chain, Transition Probability Matrix, classification of states, recurrence state- simple problems.
UNIT - III	Basic limit theorem of Markov chain (statement only), stationary probability distribution - Simple applications.
UNIT - IV	Continuous Time Markov chain: Pure birth process, Poisson process, Birth and Death process- Simple problems.
UNIT - V	Applications of Markov Chain: Social mobility, disease and recovery, consumer behavior, discount for insurance premium. .

TEXT BOOKS:

1. Medhi,J.(2002) Stochastic Processes, New Age International, New Delhi.
2. Bhat, U.N.(1972) Elements of Applied Stochastic Processes, Wiley, New York.

REFERENCE BOOKS :

1. Ross, S.M. (1983) Stochastic processes, Wiley, New York.
2. Karlin, S. and Taylor, H.M. (1975) A first course in Stochastic processes, Academic Press, New York. .

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Apply stochastic models.	**K3**
CO2	Identify the situations of stochastic modelling.	**K3**
CO3	Understand the concepts and their application of morkov chain.	**K2**
CO4	Solve problems in Markov chain.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	2	1	3	3	3	2	1	3	**2.4**
CO2	3	3	2	1	3	3	3	-	-	3	**2.1**
CO3	3	3	2	1	3	3	3	-	-	3	**2.1**
CO4	3	3	2	1	3	3	3	2	1	3	**2.4**
							Mean Overall Score				**2.25**

Result: The Matrix score of this Course is 2.25(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\textbf{Total of Values}}{\textbf{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\textbf{Total of Mean Scores}}{\textbf{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

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CREDIT: 4	COURSE CODE: U21ST6C13P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – VI SEMESTER - CORE COURSE - XIII

(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL COMPUTING LAB - IV

COURSE OBJECTIVES :

To make the Students to:

1. Compute the various statistical measures in design of experiments, time series, index numbers and transition probability matrix.

UNIT - I	Analysis of CRD, RBD, and LSD. Missing plot techniques in RBD and LSD. (With one and two missing observations).
UNIT - II	Analysis of $2^2, 2^3$ and 3^2 factorial experiments, confounding in 2^3 factorial designs.
UNIT - III	Time series - Moving averages, Fitting of linear, Quadratic and polynomial trends. Determination of Seasonal indices - Simple average, Ratio - to - Moving Average, Link Relative method.
UNIT - IV	Index numbers - Laspeyre's, Paasche's, Fisher's, Bowley's, Marshall and Edge worth, and Kelley's methods. Test for Index Numbers - Time reversal test and Factor reversal test. Cost of living Index Number.
UNIT - V	Markov chain: Transition Probability Matrix, classification of states, recurrence state.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Analysis and interpret design of experiment, Time series, Index number and Morkov chain using Python.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	2	1	3	3	3	3	-	3	**2.4**
							Mean Overall Score				**2.4**

Result: The Matrix score of this Course is 2.4(High relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST6E2**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., STATISTICS – VI SEMESTER - ELECTIVE COURSE - II
(For the candidates admitted from the year 2021-22 onwards)

OFFICIAL STATISTICS

COURSE OBJECTIVES :

To make the Students to:

1. Learn the concept of time series and their components.
2. Recognize the nature of the trend represented by the sequence of observations, and fore casting using time series variable.
3. understand Changes in the value of money, cost of living,
4. Understand Statistical principles and techniques relevant to psychological research.
5. Know about the various statistical organizations in India.
6. Understand about role of statistics in RBI.

UNIT - I	Time series: Concept - Components of Time series - Additive and Multiplicative models- Resolving components of a time series-measuring trend: Graphic, semi-averages, moving average and principle of least squares methods.
UNIT - II	Seasonal variation - measuring seasonal variation: method of simple averages, ratio-to-trend method, ratio-to-moving average method and link relative method- Cyclical and Random fluctuations- variate difference method.
UNIT - III	Index numbers and their definitions -simple and weighted index numbers - Laspeyre's, Paasche's, Fisher's, and Marshall-Edge worth index numbers - optimum tests for index numbers-Cost of living index numbers - construction and uses of fixed and chain based index numbers.
UNIT - IV	Psychological Statistics: Percentile curve and percentile ranks-their uses – combination and comparison of examination scores - Norms and scaling procedures-T and C scaling of tests - Reliability of measurements - method of measuring reliability - Internal consistency and reliability - item validity - special correlation methods.
UNIT - V	Official Statistics: Present official statistical systems in India - Ministry of Statistics and Programme Implementation -NSSO, CSO and their functions - Registration of vital events - National Income Statistics - Agricultural Statistics - Industrial Statistics in India - Trade Statistics in India - Labour Statistics in India - Financial Statistics in India. Statistical information on Indian Economy published by Reserve Bank of India. Statistics of Department of Economics and Statistics of State Governments.

TEXT BOOKS:

1. Gupta, S.C.and Kapoor, V.K (2007) Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. R.S.N. Pillai and V. Bagavathi (1995), Statistics, Third Edition, S. Chand & Company, New Delhi.

REFERENCE BOOK :

1. Central Statistical Organization (2011), Statistical Systems in India, Department of Statistics, Ministry of Planning, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand the concept of time series and their components.	**K2**
CO2	Identify the nature of the trend represented by the sequence of observations, and fore casting using time series variable.	**K3**
CO3	Understand Changes in the value of money and cost of living.	**K2**
CO4	Know statistical principles and techniques relevant to psychological research.	**K2**
CO5	Impart knowledge about the various statistical organizations in India.	**K2**
CO6	Understand role of statistics in RBI.	**K2**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	**PO2**	**PO3**	**PO4**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	1	-	3	2	1	-	-	-	**1.3**
CO2	3	3	1	-	3	2	3	3	3	3	**2.4**
CO3	3	3	1	-	3	2	3	3	3	3	**2.4**
CO4	3	3	1	-	3	2	3	3	3	3	**2.4**
CO5	3	3	1	2	3	1	1	-	-	-	**1.4**
CO6	3	3	1	2	3	1	1	-	-	-	**1.4**
							Mean Overall Score				**1.89**

Result: The Matrix score of this Course is 1.89(Medium relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: Dr. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 5 **COURSE CODE: U21ST6E3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., STATISTICS – VI SEMESTER - ELECTIVE COURSE - III

(For the candidates admitted from the year 2021-22 onwards)

DEMOGRAPHY

COURSE OBJECTIVES:

To make the Students to:

1. Know vital statistics.
2. Measure the events birth, death, life table migration and population projection.

UNIT - I	Demographic Data: Demography - definition-sources of demographic data - population census -demographic surveys - Registration method: vital registration - population register and other administrative records, registration of population in India.
UNIT - II	Fertility: Fertility measurements - crude birth rates - general, specific and total fertility rates -gross and net reproduction rates and their interpretation.
UNIT - III	Mortality: Mortality measurements: crude death rate - specific death rate-standardized death rate-infant mortality rate - maternal mortality rate - case fertility rate-comparative mortality index - force of mortality - graduation mortality rates-Makeham's law.
UNIT - IV	Life Table and Migration: Description and construction of various columns of a life table and their relationships-construction of an abridged life table - Reid and Pearl method-uses of life table - migration-factors effecting migration-gross and net migration rates.
UNIT - V	Population Growth: Population projection - population estimates and projection - arithmetic, geometric and exponential growth rates - logistic curve and its suitability for graduating population data-Basic ideas of stationary and stable population.

TEXT BOOKS:

1. Gupta, S.C.and Kapoor, V.K (2007) Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
2. Kumar, R. (1986). Technical Demography. John Wiley & Sons, Canada.

REFERENCE BOOKS:

1. Agarwala, S.N. (1991) Indian Population Problems, Tata McGraw Hill, New Delhi.
2. Hansraj, D.R. (1981) Fundamentals of Demography, Surjeet publications, New Delhi.
3. Bogue, D. J. (2007).Principles of Demography, Wiley, New York.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand registered information of vital events.	**K2**
CO2	Evaluate the events birth, death, and life table migration and population projection.	**K5**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcome	Program outcomes				Program specific outcomes						Average
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	3	2	2	3	2	2	2	2	3	**2.4**
CO2	3	3	2	2	3	3	3	2	2	3	**2.4**
							Mean Overall Score				**2.4**

Result: The Matrix score of this Course is 2.4(Medium relationship)

Mapping Scale

Mapping	1 – 33%	34 – 66%	67 -100%
Scale	1	2	3
Relation	0.0 – 1.0	1.1 – 2.0	2.1 – 3.0
Quality	Poor	Moderate	High

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: DR. M. SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT: 3 **COURSE CODE: U21GE1A1**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., GEOGRAPHY - I SEMESTER - FIRST ALLIED COURSE – I
(For the candidates admitted from the year 2021-22 onwards)

STATISTICS - I

COURSE OBJECTIVES:

To make the Students to:

1. Learn basic concepts of Statistics.
2. Understand and solve the problems in descriptive statistics.

UNIT – I	Definition of Statistics – its functions and Characteristics. Statistical Data – Primary and Secondary. Methods of collecting primary data & secondary data. Classification – Definition, objects of Classification and types of classification. Tabulation – Definition, role of tabulation, Parts of a table and types of tables.
UNIT – II	Diagrammatic representation – its Significance, rules for construction. Types of diagrams – Simple bar diagram and component bar diagram. Pie diagram. Graphs of frequency distributions – Histogram and ogives.
UNIT – III	Measures of Central Tendency – Arithmetic mean, median, mode, Geometric mean & Harmonic mean, Quartiles – merits and demerits and problems.
UNIT – IV	Measures of Dispersion – Range, Quartile Deviation and Standard deviation – their coefficients, merits & demerits, problems.
UNIT – V	Measures of Skewness – Karl Pearson's co-efficient of skewness and Bowley's co-efficient of skewness – problems. Kurtosis - Concept only.

TEXT BOOK:

S.P.GUPTA, "**ELEMENTARY STATISTICAL METHODS**", (2012) Sultan Chand and sons, New Delhi.

REFRENCES BOOKS:

1. **R.S.N. PILLAI** & **V.BAGAVATHI.** "**STATISTICS**" – (Reprint 2013) Sultan Chand and Sons, New Delhi.
2. **S.P. GUPTA**. "**STATISTICAL METHODS**" – (Reprint 2011) Sultan Chand and sons, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand concepts of basic statistics.	**K2**
CO2	Solve the problems in Descriptive statistics.	**K5**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented		Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Name: STATISTICS - I						**Course Code: U21GE1A1**	
Course Outcome	**Program Specific Outcomes**						**Average**
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	3	-	-	3	**2**
CO2	3	3	3	-	-	3	**2**
			Mean Overall Score				**2**

Result: The Matrix score of this Course is 2(Medium relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: DR.M.SARAVANA KUMAR

CHAIRMAN – BOS **CONTROLLER OF EXAMINATIONS**

CREDIT:4	COURSE CODE: U21GE2A2P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., GEOGRAPHY – II SEMESTER – FIRST ALLIED COURSE – II
(For the candidates admitted from the year 2021-22 onwards)

STATISTICS - II

COURSE OBJECTIVES:

To make the Students to:

1. Solve the problems in descriptive statistics.

UNIT – I	Formation of frequency distribution and frequency table. Diagrams and Graphs. Measures of central tendency. Measuring dispersion. Measures of Skewness.
UNIT – II	Correlation and Rank Correlation and Regression.
UNIT – III	Index Numbers.
UNIT – IV	Time Series.
UNIT – V	Testing of hypothesis: ❖ Large Sample(single mean, difference between two mean) ❖ Small Sample(single mean, difference between two mean and paired t-test) ❖ Chi – Square test.(Two attributes only) ❖ F – Test.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Solve the problems in Descriptive statistics.	**K3**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Course Name: STATISTICS-II						**Course Code: U21GE1A2P**	
Course Outcome	**Program Specific Outcomes**						**Average**
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	3	-	-	3	**2**
			Mean Overall Score				**2**

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: DR.M.SARAVANA KUMAR

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

CREDIT:3 **COURSE CODE: U21GE2A3**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
B.Sc., GEOGRAPHY - II SEMSTER - FIRST ALLIED COURSE – III
(For the candidates admitted from the year 2021-22 onwards)

STATISTICS-III

COURSE OBJECTIVES

To make the Students to:

1. Learn relationship between two variables.
2. Understand concept and application of index numbers.
3. Understand concept and application of Time series.
4. Test the hypothesis and interpret for large and small samples.

UNIT – I	Simple correlation - Definition and types of correlation - Methods of studying correlation - Scatter Diagram, Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation Coefficient and Simple Linear Regression analysis .
UNIT – II	Index numbers - their definition, construction and uses - Laspeyer's, Paasche's and Fisher's ideal index numbers. Tests of adequacy of a good index number - Time Reversal test & Factor Reversal test.
UNIT – III	Time Series - concept and definition, Components of Time Series - Secular trend, Seasonal variation, cyclical variation and Irregular variations. Measurement of Trend by the method of moving average and method of least squares.
UNIT – IV	Testing of hypothesis - Definition of hypothesis - null hypothesis and alternative hypothesis, standard error, level of significance, critical region, parameters and statistic. Type I and Type II errors, one tailed and two tailed tests. Test procedure. Large sample tests - Test for single mean and difference between two means. - Problems.
UNIT – V	Small sample tests - "t" test for single mean, difference between two means and paired "t" test - Problems. Chi-square test for independence of attributes (Two attributes only) - "F" - Test - Problems.

TEXT BOOK:

S.P.GUPTA, "**ELEMENTARY STATISTICAL METHODS**", (2012) Sultan Chand and sons, New Delhi.

REFRENCES BOOKS:

1. R.S.N. PILLAI & V.BAGAVATHI. "STATISTICS" - (Reprint 2013) Sultan Chand and sons, New Delhi.
2. S.P. GUPTA. "STATISTICAL METHODS" - (Reprint 2011) Sultan Chand and sons, New Delhi.

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand relationship between two variables.	**K2**
CO2	Understand concept and application of index numbers.	**K3**
CO3	Understand concept and application of Time series.	**K3**
CO4	Test the hypothesis and interpret for large and small samples.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Name: STATISTICS-III						**Course Code: U21GG1A3**	
Course Outcome	**Program Specific Outcomes**						**Average**
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	3	-	-	3	**2**
CO2	3	3	3	-	-	3	**2**
CO3	3	3	2	-	-	3	**2**
CO4	3	3	3	-	-	3	**2**
			Mean Overall Score				**2**

Result: The Matrix score of this Course is 2(Medium relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER: DR.M.SARAVANA KUMAR

CHAIRMAN-BOS **CONTROLLER OF EXAMINATIONS**

CREDIT:2	COURSE CODE: U21ST3N1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., - GEOLOGY - III SEMESTER - NON CORE ELECTIVE – I

(For the candidates admitted from the year 2021-22 onwards)

BIO – STATISTICS

COURSE OBJECTIVES:

To make the Students to:

1. Apply statistical techniques in biological sciences and to demonstrate the statistical methods in real-life situations.

UNIT – I	Bio-statistics and biometry - meaning - descriptive biostatistics - sample statistics history statistical terms - limitations of statistical methods - aims of biostatistics - applications of biostatistics - role of biostatistics - parametric and non-parametric.
UNIT – II	Classification - Meaning of Classification - Objects of Classification - Rules of Classification - Types of Classification - Difference between classification and Tabulation - Parts of Tabulation - Structure of Tabulation - Rules of Tabulation - Types of Tabulation.
UNIT – III	Diagrams and Graphs - Presentation of biometric data - graphic presentation of data - types of graphs - line -histogram- frequency polygon - kite diagram - stem and leaf displays - frequency curve or OGIVE - scatter or dot diagram - diagrammatic presentation of data - bar diagram - pie chart - pareto charts.
UNIT – IV	Measures of central tendency - standard score or Z score - percentiles - Quartiles - Deciles - Measures of dispersion.
UNIT – V	Correlation - Karl Pearson's Coefficient of Correlation - Spearman's Rank Correlation Coefficient. Regression - Linear Models - Properties - Problems.

TEXT BOOK:

1. VEER BALA RASTOGI, "FUNDAMENTALS OF BIOSTATISTICS", Anu Books Pvt. Ltd. New Delhi. 2009.

REFERENCES BOOK:

1. **S**.PALANICHAMY, "BIO-STATISTICS", Palani Paramount Publishing Ltd. Palani.

(Note: All examples and problem to be related to Medical Statistical data only.)

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COURSE OUTCOMES:

By the end of this course, Students will be able to:

Course Outcome	Course Outcome	Knowledge Level
CO1	Understand concepts of Biostatistics.	**K2**
CO2	Apply statistical tools in bio-field.	**K3**
CO3	Compute statistics using excel.	**K4**

K1 = Remember, K2 = Understand, K3 = Apply, K4 = Analyze, K5 = Evaluate, K6= Create

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Name: BIO – STATISTICS						**Course Code: U21ST3N1**
Course Outcome	**PROGRAM SPECIFIC OUTCOMES**					**Average**
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	3	3	-	-	3	**2**
CO2	3	3	3	-	-	3	**2**
CO3	3	3	3	3	-	3	**2.5**
			Mean Overall Score				**2.17**

Result: The Matrix score of this Course is 2.17(High relationship)

Mapping Scale

Mapping	**1 – 33%**	**34 – 66%**	**67 -100%**
Scale	**1**	**2**	**3**
Relation	**0.0 – 1.0**	**1.1 – 2.0**	**2.1 – 3.0**
Quality	**Poor**	**Moderate**	**High**

Value Scaling

Mean Score of Cos= $\frac{\text{Total of Values}}{\text{Total No.of POs \& POs}}$	**Mean Overall Score of Cos=** $\frac{\text{Total of Mean Scores}}{\text{Total No.of COs}}$

COURSE DESIGNER:

CHAIRMAN-BOS **CONTROLLER OF EXAMINATIONS**

CREDIT:2	COURSE CODE: U21ST4N2P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005

B.Sc., - GEOLOGY - IV SEMSTER - NON CORE ELECTIVE – II

(For the candidates admitted from the year 2021-22 onwards)

STATISTICAL DATA ANALYSIS (LAB ORIENTED - PRACTICAL)

COURSE OBJECTIVES

To make the Students to:

1. Compute various statistical measures using Excel packages.

UNIT – I	Diagrams and Graphs.
UNIT – II	Measures of Central Tendencies - Mean - Median - Mode - Quartiles - Geometric Mean - Harmonic Mean.
UNIT – III	Measures of Dispersion - Coefficient of Range - Quartile Deviation - Mean Deviation - Standard Deviation - Coefficient of variation.
UNIT – IV	Correlation - Karl Pearson's Coefficient of Correlation - Spearman's Rank Correlation Coefficient.
UNIT – V	Regression - Linear Models - X on Y and Y on X.

TEXT BOOK:

1. VEER BALA RASTOGI, "FUNDAMENTALS OF BIOSTATISTICS", Anu Books Pvt. Ltd. New Delhi. 2009.

REFERENCES BOOK:

2. S.PALANICHAMY, "BIO-STATISTICS", Palani Paramount Publishing Ltd. Palani.

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