KUNTHAVAI NAACCHIYAAR GOVERNMENT ARTS COLLEGE FOR WOMEN

An Autonomous College Affiliated to Bharathidasan UniversityRe-Accredited by NAAC with 'B' Grade

Thanjavur -613 007, Tamil Nadu, India.

CBCS & OBE

Scheme of Instruction and Syllabus for

B.Sc., Statistics

(I to VI Semester)

CONTROLLER OF EXAMINATIONS
05 AUG 2023
KNGovt. Arts College for Women (Autonomous), Thanjavur-7

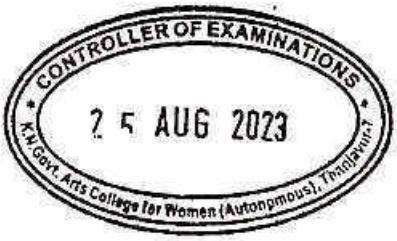
Effective from 2023 - 2024 and onwards

PG DEPARTMENT OF STATISTICS

B.SC., STATISTICS

SYLLABUS

FROM THE ACADEMIC YEAR 2023-2024



TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI – 600 005

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   05/07/23

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26 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

25/08/2023
HOD OF S
K.N.G.A.C. (W. [illegible]U)
THANJAVUR

KUNTHAVAI NAACCHIYAAR GOVT. ARTS COLLEGE FOR WOMEN

(AUTONOMOUS) THANJAVUR – 7

POST GRADUATE DEPARTMENT OF STATISTICS

I - B.Sc., Statistics., Course Structure under CBCS

(For the candidates admitted from the academic year 2023-2024 onwards)

Semester	Part	Code	Subject Code	Title of the Paper	Hrs	Credit	Exam Hrs	Marks		Tot
								IA	EA	
I	I	LC I	23K1T1	1.1 Tamil	6	3	3	25	75	10
	II	ELC I	23K1E1	1.2 English	6	3	3	25	75	10
	III	CC I	23K1S01	1.3 Probability Theory	5	5	3	25	75	1(
		CC II	23K1S02	1.4 Descriptive Statistics	3	3	3	25	75	10
		EC I	23K1SECS1:1	1.5 Mathematics for Statistics	4	4	3	25	75	10
			23K1SECS1:2	1.5 Statistics and Mathematics -I						
		ECII		1.6 Practical – I (Calculator Based– Descriptive Statistics and Distribution Theory)	2	-	-	-	-	-
	IV	SEC I	23K1SSEC1	1.7 Basic of Statistics – 1	2	2	3	25	75	10
		FC	23K1SFC	1.8 Bridge - Elementary Statistics	2	2	3	25	75	10
				TOTAL	30	22				7(
II	I	LC II	23K2T2	2.1 Tamil	6	3	3	25	75	10
	II	ELC II	23K2E2	2.2 English	6	3	3	25	75	10
	III	CC III	23K2S03	2.3 Matrix and Linear Algebra	5	5	3	25	75	10
		CC IV	23K2S04	2.4 Distribution Theory	3	3	3	25	75	10
		ECII	23K2SECS2P	2.5. Practical –I (Calculator Based– Descriptive Statistics and Distribution Theory)	2	2	3	25	75	10
		EC III	23K2SECS3:1	2.6 Real Analysis	4	3	3	25	75	10
			23K2SECS3:2	2.6 Fuzzy Set theory						

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	SEC II	23K2SSEC2P	2.7 Practical – II (Data Analysis Using MS - Excel)	2	2	3	25	75	100
	SEC III	23K2SSEC3	2.8 Basic of Statistics -II	2	2	3	25	75	100
IV			TOTAL	30	23				800
I	LC III	23K3T3	3.1Tamil	6	3	3	25	75	100
II	ELC III	23K3E3	3.2 English	6	3	3	25	75	100
III	CC V	23K3S05	3.3 Estimation Theory	3	3	3	25	75	100
	CC VI	23K3S06	3.4 Sampling Techniques	5	5	3	25	75	100
	EC IV	23K3SECS4:1	3.5 Numerical Methods	4	4	3	25	75	100
		23K3SECS4:2	3.5 Financial Statistics						
	EC V		3.6 Practical – III (Calculator Based– Statistical Inference)	2	-	-	-	-	-
	SEC IV	23K3SSEC4P	3.8 Practical – IV (Calculator Based - Sampling Techniques)	2	2	3	25	75	100
IV	SEC V	23K3SSEC5	3.7 Database Management System	1	1	3	25	75	100
	EVS		3.9 Environmental Studies	1	-	-	-	-	-
	ECC1	23K3SECC1: 1	Competitive Exam Skill (Contents In Tamil)	-	3*	-	-	100	100
		23K3SECC1: 2	MOOC (Value Added Course)						
	ECC2	23K3SECC2	COMPUTATIONAL STATISTICS(Add on Course)	-	4*	-	-	-	-
			TOTAL	30	21				700
I	LC IV	23K4T4	4.1 Tamil	6	3	3	25	75	100
II	ELC IV	23K4E4	4.2 English	6	3	3	25	75	100
III	CC VII	23K4S07	4.3 Testing of Statistical Hypothesis	3	3	3	25	75	100
	CC	23K4S08	4.4 Actuarial Statistics	4	4	3	25	75	100

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VII									
	EC V	23K4SECS5P	4.5 Practical – III (Calculator Based– Statistical Inference)	2	2	3	25	75	100
	EC VI	23K4SECS6:1	4.6 Economic and official Statistics	4	3	3	25	75	100
		23K4SECS6:2	4.6 Econometrics / Population Studies						
	SEC VI	23K4SSEC6P	4.7 Practical– V (Statistical Software Using R)	2	2	3	25	75	100
IV	SEC VII	23K4SSEC7	4.8 Survey Sampling and Indian official Statistics	2	2	3	25	75	100
	EVS	23K4SEVS	4.9 Environmental Studies	1	2	3	25	75	100
	ECC3	23K4SECC3:1	Quantitative Aptitude	-	3	3	-	-	100
		23K4SECC3:2	MOOC (Value Added Course)						
			TOTAL	30	24				900
III	CC IX	23K5S09	5.1 Stochastic Process	6	5	3	25	75	100
	CC X	23K5S10	5.2 Regression Analysis	6	5	3	25	75	100
	CC XI (P)	23K5S11P	5.3 Practical-VI (Core IX & X)	6	5	3	25	75	100
	CC XII	23K5S12PW	5.4 Project	6	4	-	-	100	100
	EC VII	23K5SECS7:1	5.5 Statistical Quality Control	4	3	3	25	75	100
		23K5SECS7:2	5.5 Simulation and Inventory Control						
IV	VE	23K5VE	5.6 Value Education	2	2	3	25	75	100
		23K5I	5.7 Summer Internship – Industrial Visit/ Field Visit	-	2	-	-	-	-
			TOTAL	30	26				600
III	CC XIII	23K6S13	6.1 Design of Experiment	7	6	3	25	75	100

CC XIV	23K6S14	6.2 Demography	7	6	3	25	75	100
CC XV(P)	23K6S15P	6.3 Practical – VII (SPSS Core XIII & XIV)	7	6	3	25	75	100
EC VIII	23K6SECS8:1	6.4 Operations Research	7	3	3	25	75	100
	23K6SECS8:2	6.4 Bayesian Inference						
SEC VIII	23K6SSEC8	6.5 Introduction to R Language/Python	2	2	3	25	75	100
	23k6EA	6.6 Extension Activity	-	1				
IV		TOTAL	30	24				500
		GRAND TOTAL	180	140				420

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H.H.Govt Arts College for Women (Autonomous) Thanjavur-7

HOD
DEPT. OF STATISTICS
A.N.G.A.C. (W) (AUTO)
THANJAVUR

Contents

1. Introduction

B.Sc. Statistics: Programme Outcome, Programme Specific Outcome and Course Outcome

Statistics is the study of Data and extracting knowledge in the data using various methods and techniques, analyze and interpret data, taking data driven predictions and decisions. It also helps data collection through sampling techniques, that is to collect data focusing on problem solving, and presenting it with wider scope of application in science, social sciences, medical science, life sciences, country's official statistics etc. Statistical methods are used as research methodology in all most all domains. The key core areas of study in Statistics include Descriptive Statistics, Probability Theory, Sampling techniques, Matrix and Linear Algebra, Distribution Theory, Estimation Theory, Testing of Statistical hypotheses, Stochastic process, Regression analysis, Design of Experiments, Demography and Official Statistics. The Bachelor's Degree B.Sc. Statistics is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements expected to be acquired by learners at the end of the Programme. Learning outcomes of Statistics are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for gaining knowledge of Statistics.

Bachelor's degree in Statistics is the culmination of in-depth knowledge in both theoretical and practical methods and techniques of Statistics. This also leads to study of related areas like Computer science, Industrial Statistics, Mathematical Statistics, Business Statistics and many more. Thus, this programme helps learners in building a solid foundation for higher studies in Statistics. The skills and knowledge gained have intrinsic aesthetics leading to proficiency in analytical reasoning. This can be utilized in Statistical modeling and solving real life problems.

Students completing this programme will be able to present Statistics clearly and precisely, make abstract ideas precise by formulating them in the language of Statistics, describe Statistical ideas from multiple perspectives and explain fundamental concepts of Statistics to those non-Statistics users.

Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs, entrepreneurship, business and research areas and jobs in various other public and private enterprises.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**U.G.**
Programme Code:	
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning:** Ability to analyze, interpret and draw conclusions

from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

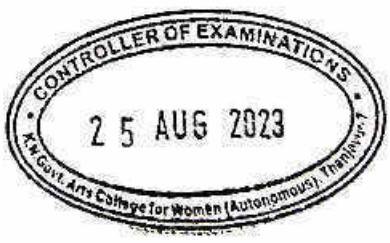
PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

Programme Specific Outcomes:	**PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. **PSO 2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. **PSO 3**: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing. **PSO 4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. **PSO 5**: Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	Y	Y	Y	Y	Y	Y	Y	Y
PSO 2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

3 – Strong, 2- Medium, 1- Low

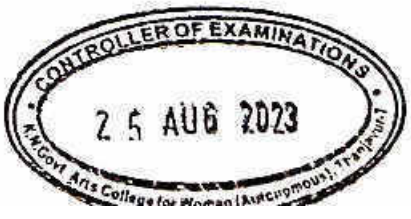


Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/ Benefits
I	**Foundation Course** To ease the transition of learning from higher secondary to highereducation,providinganoverviewofthepedagogyoflearningLiteratureandanalysingtheworldthroughtheliterarylens Give sire to anew perspective.	➢ Instill confidence among students ➢ Create interest for the subject
I,II,III,IV	**Skill Enhancement papers**(Discipline centric /Generic/Entrepreneurial)	➢ Industry ready graduates ➢ Skilled human resource ➢ Students are equipped with essential skills to Make them employable
		➢ Training on language and communication skills enable the students gain Knowledge and Exposure in the competitive world.
		➢ Discipline centric skill will improve the Technical knowhow of solving real life problems.
III,IV,V& VI	Elective papers	➢ Strengthening the domain knowledge ➢ Introducing the stakeholders to the State-of Art techniques from the streamsofmulti-disciplinary,crossdisciplinaryandinterdisciplinarynature ➢ Emerging topics in higher education/industry/communicationnetwork/healthsectoretc.areintroducedwith



		hands-on-training.
IV	Elective Papers	➢ Exposure to industry molds students into solution providers ➢ Generates Industry ready graduates ➢ Employment opportunities enhanced
V Semester	Elective papers	➢ Self-learning is enhanced ➢ Application of the concept to real situation is conceived resulting Intangible outcome
VI Semester	Elective papers	➢ Enriches the study beyond the course. ➢ Developing are search framework and presenting their independent and Intellectual ideas effectively.
Extra Credits: **For Advanced Learners/Honors degree**		➢ To cater to the need softer learners/research Aspirants
Skills acquired from the Courses	Knowledge, Problem Solving, Analytical ability,ProfessionalCompetency,ProfessionalCommunicationandTransferrable Skill	

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Credit Distribution for UG Programmes

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
1.1 Part 1. Language – Tamil	3	6	2.1Part..1. Language – Tamil	3	6	3.1Part..1. Language – Tamil	3	6	4.1Part..1. Language – Tamil	3	6	5.1 Core Course –\CC IX	5	6	6.1 Core Course – CC XIII	6	7
1.2 Part.2 English	3	6	2.2Part..2 English	3	6	3.2Part..2 English	3	6	4.2Part..2 English	3	6	5.2 Core Course – CC X	5	6	6.2 Core Course – CC XIV	6	7
1.3 Core Course – CC I	5	5	2.3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	4	4	5. 3.Core Course CC -XI	5	6	6.3 Core Course – CC XV	6	7
1.4 Core Course – CC II	3	3	2.4 Core Course – CC IV	3	3	3.4 Core Course – CC VI	3	3	4.4 Core Course – CC VIII	3	3	5. 4.Core Course –/ Project with viva-voce CC -XII	4	6	6.4 Elective - VIII Generic/ Discipline Specific	3	7
1.5 Elective I Generic/ Discipline Specific	4	4	2.5 Elective II Generic/ Discipline Specific	2	2	3.5 Elective IV Generic/ Discipline Specific	4	4	4.5 Elective V Generic/ Discipline Specific	2	2	5.5 Elective VII Generic/ Discipline Specific	3	4	6.5 Skill Enhancement Course SEC-8/ Professional Competency Skill	2	2
1.6 Elective II Generic/ Discipline	-	2	2.6 Elective III Generic/	3	4	3.6 Elective V Generic/ Discipline Specific	-	2	4.6 Elective VI Generic/	3	2	5.6 Value Education	2	2	6.6 Extension Activity	1	-

Specific			Discipline Specific						Discipline Specific									
1.7 Skill Enhancement Course SEC-1	2	2	2.7 Skill Enhancement Course SEC-2	2	2	3.7 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.7 Skill Enhancement Course SEC-6	2	2	5.7 Summer Internship /Industrial Training	2	-			
1.8 Skill Enhancement - (Foundation Course)	2	2	2.7 Skill Enhancement Course –SEC-3	2	2	3.8 Skill Enhancement Course SEC-5	2	2	4.8 Skill Enhancement Course SEC-7	2	2							
						3.9 E.V.S.	-	1	4.9 E.V.S	2	1							
						ECC1:Self study /Mooc	3	-	ECC3:Self study /Mooc	3	-							
						ECC2: Add on course	4	-										
	22	**30**		**23**	**30**		**21**	**30**		**24**	**30**		**26**	**30**		**24**	**30**	
Total – 140 Credit + Extra Credit Maximum 10																		

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Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses& Elective Courses [in Total]	12	14
	Skill Enhancement Course SEC-1	2	2
Part-4	Foundation Course	2	2
		22	30

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses& Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	30

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses& Elective Courses including laboratory [in Total]	12	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		21	30

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Semester-IV

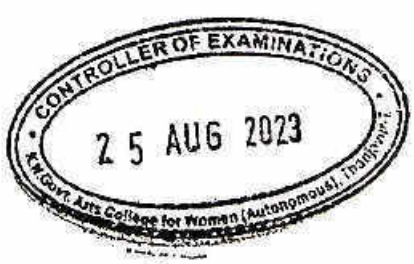
Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses& Elective Courses including laboratory [in Total]	12	13
Part-4	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		24	**30**

Third Year - Semester-V

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	26
Part-4	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	2
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	21	28
Part-4	Professional Competency Skill	2	-
	Extension Activity	1	2
		24	**30**



Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	12	13	12	12	22	21	92
Part IV	4	4	3	6	4	1	22
Part V	-	-	-	-	-	2	2
Total	22	23	21	24	26	24	140

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall(K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/Comprehend(K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or Overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze(K4)	Problem-solvingquestions,Finishaprocedureinmanysteps,Differentiate	
	Between various ideas, Map knowledge	
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create(K6)	Checkknowledgeinspecificoroffbeatsituations,Discussion,Debatingor Presentations	

Paper Type	Credit	Nos	Total
Language	3	8	24
Core- Papers	4	15	60
Allied / Elective	3	8	24
Ability Enhancement Compulsory Course (AECC) Soft Skill-	2	15	30
Extension Activity	1	2	2
Total			140

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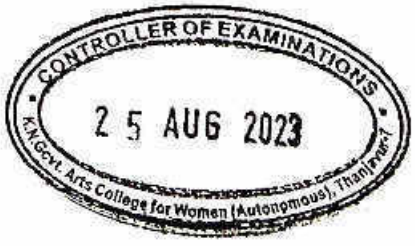
HOD OF STATIS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Probability Theory**					
Paper Number		**CORE I**					
Category	Core	**Year**	I	**Credits**	5	**Course Code**	23K1S01
		Semester	I				
Instructional Hours Per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		4	1		--	5	
Pre-requisite		Basic Knowledge on events and set theory					
Objectives of the Course		The main objectives of this course are: 1. To describe the importance and scope of probability theory and to predict the chance of an experimental outcomes. 2. It provides the study of random variable, distribution function, mathematical expectation, 3. Generating function and law of large numbers. 4. Two-dimentional variables and its distributions					
Course Outline		**Unit-I** Theory of Probability: Introduction-Basic terminology-Definition - Axiomatic approach – Types of Events - Conditional Probability - Addition and Multiplication theorems of Probability for 'two' and 'n' events (Statement and Proof) - Boole's inequality (Statement and Proof)- Bayes' theorem of Probability (Statement and Proof with numerical illustration -very simple problems)					
		Unit-II Random variables and Distribution functions: Introduction - Discrete random variable: Probability mass function-Discrete distribution function, Properties. Continuous random variable : Probability density function and properties, measures of central tendency, dispersion, Skewness and kurtosis for continuous Probability distribution.					
		Unit-III Two dimensional random variables - Joint probability mass function- Marginal probability function, Conditional probability function. Two dimensional distribution functions-Marginal distribution functions - Joint density function-Marginal density function - Conditional distribution function - Conditional probability density function. Transformation of One - Dimensional and Two Dimensional random variable (concept only).					
		Unit-IV Mathematical Expectations: Introduction- Expected value of a random variable (Discrete and Continuous)-Expected value of function of a random variable - Properties of Expectation-Properties of variance- Covariance. Inequalities involving expectation: Cauchy Schwartz and Markov inequalities.					

	Unit-V Generating functions: M.G.F-Properties-Uniqueness theorem - C.G.F-Properties- P.G.F-Properties. Characteristic Function: Properties–Inversion theorems (Statement only)- Uniqueness theorem (Statement only). Chebychev's Inequality (Statement and Proof). Law of Large Numbers (L.L.N): Convergence in probability - Properties: Weak L.L.N - properties-Bernoulli's L.L.N (Statement and Proof) - Khinchin's theorems (Statement only).
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Gupta S.C. and Kapoor V.K (2015): Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
Reference Books	1. Rohatgi, V.K. (1984): An introduction to probability theory and mathematical statistics. 2. Hogg. R.V. and Craig. A.T. (1978) : Introduction to Mathematical Statistics, McGraw Hill Publishing Co. Inc. New York. 3. Mood A.M. Graybill, F.A. and Bose. D.C. (1974): Introduction to the theory of Statistics, McGraw Hill Publishing Co. Inc. New York. 4. Sanjay Arora and Bansilal (1989): New Mathematical Statistics, Satyaprakashan, New Delhi
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject www.khanacademy.org/math/statistics-probability/random-variables-stats-library https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/



Course Learning Outcome(for Mapping with POs and PSOs)

Students will be able to

CLO-1: Understand concepts of probability and identify the different approaches of probability theory

CLO-2: Define the random variable and its respective probability values and to compare a discrete and continuous random variable.

CLO-3: Calculate the expected value of a random variable variance, covariance, moments and find the conditional expectation and variance of bi-vitiate random variable.

CLO-4: Estimate the measures of central values, Dispersions, Skewness and Kurtosis through the generating function

CLO-4: Calculate the mean and variance through some law of large numbers.

CLO-5: Understand bivariate random variables and its distributions

CLO-6: Application of probability theory in real life

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	S	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H. Govt. Arts College for Women (Autonomous), Thanjavur

HEAD OF STATISTICS

Title of the Course	**Descriptive Statistics**						
Paper Number	**CORE II**		**Credits**	3	**Course Code**	**23K1S02**	
Category	Core	**Year**	I				
		Semester	I				
Instructional Hours Per week	**Lecture**		**Tutorial**		**Lab Practice**	**Total**	
	2		1		--	3	
Pre-requisite	Basic arithmetic						
Objectives of the Course	The main objectives of this course are: 1. It explains the important concepts of statistics and statistical data. 2. It provides to formulate the visualization of frequency distribution. 3. Also they measure the averages, dispersions, lack of symmetry, moments, relationship among variables. 4. Estimate and predict the unknown and future values. 5. Study of non-linear and consistency of the data.						
Course Outline	**Unit-I** Statistics: Introduction - Definition – Functions - Applications - Limitations. Organizing a Statistical Survey: Planning the survey - Executing the survey-Collection of Data: Primary and secondary data - Methods of collecting primary data - Sources of secondary data. Sampling: Census and Sample methods. Classification-Types - Formation of frequency distribution-Tabulation - parts of a Table - Types. Diagrammatic representation – Types. Graphical representation - Graphs of frequency distributions. Merits and Limitations of diagrams and graphs.						
	Unit-II Measures of Central tendency: Introduction-Definitions-Types - Mean-Median-Mode-Geometric mean-Harmonic Mean-Weighted mean - Merits and Demerits-Measures of Dispersion: Introduction – Definition – Types – Range - Quartile deviation - Mean deviation - Standard deviation - Co-efficient of variation – Lorenz curve - Merits and Demerits.						
	Unit-III Skewness: Introduction-Definition-Types-Karl Pearson's – Bowley's - Kelly's methods – Their merits and demerits. Kurtosis: Introduction-Definition-Types-Its merits and demerits. Moments: Introduction - Definition-Types - Raw, Central moments and their relations.						
	Unit-IV Correlation analysis: Introduction - Definition - Types – Ungrouped and Grouped data – Probable error – properties - Rank correlation – Partial and Multiple correlations - Regression analysis: Introduction - Definition – Regression Equations -Multiple regression - Principle of least squares for first degree, Second degree,						

	Exponential and Power curves. **Unit-V** Theory of Attributes: Introduction – Definition-Classes and Class frequencies-Consistency of data-Independence of attributes-Association of attributes-Yule's coefficient and -Coefficient of Colligation.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Gupta, S.P. (2017): Statistical Methods, Sultan Chand & Sons Pvt Ltd, New Delhi, 35th Revised Edition. 2. Gupta S.C and Kapoor, V.K. (2002). Fundamentals of Mathematical Statistics, Sultan Chand & Sons Pvt. Ltd., New Delhi
Reference Books	5. Goon A.M. Gupta. A.K. and Das Gupta, B (1987). Fundamental of Statistics, vol.2 World Press Pvt. Ltd., Kolkatta 6. G.U.Yule and M.G. Kendall (1956). An introduction to the theory of Statistics, Charles Griffin. 7. M.R. Spiegel (1961). Theory and problems of Statistics, Schaum's outline series. 8. Anderson, T.W. and Sclove SL. (1978). An introduction to statistical analysis of data, Houghton Miffin & co. 9. Pillai, R.S., and Bagavathi (2003): Statistics, S. Chand and Company Ltd., New Delhi.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject https://en.wikipedia.org/wiki/Statistics https://en.wikipedia.org/wiki/Descriptive_statist https://socialresearchmethods.net/kb/statdesc.php http://onlinestatbook.com/2/introduction/descriptive.html

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1: Describe the scope, functions, applications and limitations of Statistics.

CLO-2: Also to explain the statistical survey, collection of data, sampling and presentation of data.

CLO-3: Discuss the importance and uses of central values and dispersions for the various types of data.

CLO-4: Also to measure the various measures of averages and scatteredness of the mass of data in a series.

CLO-5: Explain about the lack of symmetry, rth moments and peakedness of the frequency distributions.

CLO-6: Ability to apply in data

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	M	S	S	S	S	S	S	S	M
CLO5	S	S	S	S	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
A.V.V.M. Sri Pushpam College (Autonomous)

PRINCIPAL
A.V.V.M. SRI PUSHPAM COLLEGE (AUTO)
POONDI-613 503

Title of the Course		**Mathematics for Statistics**					
Paper Number		**Elective I (Discipline Specific)**					
Category	Core	**Year**	I	**Credits**	4	**Course Code**	23K1SECS1:1
		Semester	I				
Instructional Hours Per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		3	1	--	4		
Pre-requisite		Calculus – Basic arithmetic					
Objectives of the Course		The main objectives of this course are: 1. The overall objective of the study is to create deep interest in learning mathematics which develop broad and balance knowledge and understanding definitions, concepts, principles and theorems. 2. It helps the students to enhance the ability of learners to apply the knowledge and skill acquired by them to solve specific theoretical and applied problems in mathematics. 3. It also encourages the students to develop a range of generic skill helpful in employment, internships in social activities.					
Course Outline		**Unit-I** Rational fractions: Proper and improper rational fractions. Partial fractions: Forms of partial fractions.					
		Unit-II Series: Summation and approximations related to Binomial, Exponential and Logarithmic series -Taylor's series, Fourier series for even and odd functions.					
		Unit-III Theory of equations: Polynomial equations with real coefficients- imaginary and irrational roots-solving equations with related roots-equation with given numbers as roots-equation whose roots are symmetric functions of roots.					
		Unit-IV Differential calculus: Functions – Different types – simple valued and many valued – Implicit and Explicit functions, Odd and even functions, periodic functions, algebraic and transcendental functions. Inverse functions, Limit of a function – Some standard limit (without proof) Differentiation of standard functions- standard rules of differentiation-Addition, subtraction, multiplication and quotient rules – function of function rule.					
		Unit-V Successive differentiation: Leibnitz's theorem, nth derivatives of standard functions – simple problems. Partial differentiation: Successive partial differentiation. Maxima and Minima for two variable functions. Homogenous function – Euler's theorem on homogenous function.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Duraipandian, P. and Udaya Baskaran, S. (2014): Allied Mathematics, Vol. – I&II,S. Chand& Company Pvt. Ltd. 2. Vittal, P.R(2012). Allied Mathematics, Margham Publications. 3. Narayanan,S ManickavachagamPillai(1993): Ancillary Mathematics, Book II : (Containing Differential Calculus) S. Viswanathan Pvt, Ltd .
Reference Books	1. Narayanan,S and ManickavachagamPillai (1993): Ancillary Mathematics (Vol. II,Part I) : (Containing Trignometry) S. ViswanathanPvt. Ltd . 2. Narayanan, S and ManickavachagamPillai (1993): Ancillary Mathematics, Book I : (Containing Algebra). S. Viswanathan Pvt.Ltd . 3. S.J.Venkatesan (2019), Algebra,Sri Krishna Publications ,Chennai-77 , skhengg1999@gmail.com
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome(for Mapping with POs and PSOs)

Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.

CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.

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25 AUG 2023

CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function

CLO-6Obtain the mathematical knowledge and skills for the better understanding of statistics as a mathematical science

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

HEAD OF STATISTICS
A.G.A.C. (W), (AUTO)
THANJAVUR

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H. Govt. Arts College for Women (Autonomous), Thanjavur-7

Title of the Course		Statistics and Mathematics - I					
Paper Number		Elective I (Discipline Specific)					
Category	Core	Year	I	Credits	4	Course Code	23K1SECS1:2
		Semester	I				
Instructional Hours Per week		Lecture	Tutorial	Lab Practice	Total		
		3	1	--	4		
Pre-requisite		Calculus – Basic arithmetic					
Objectives of the Course		The main objectives of this course are: 1. The overall objective of the study is to create deep interest in learning mathematics which develop broad and balance knowledge and understanding definitions, concepts, principles and theorems. 2. It helps the students to enhance the ability of learners to apply the knowledge and skill acquired by them to solve specific theoretical and applied problems in mathematics. 3. It also encourages the students to develop a range of generic skill helpful in employment, internships in social activities.					
Course Outline		**Unit-I** Census method – sampling method, Non – probability sampling – Judgement sampling, Quota sampling – advantages and disadvantages, probability sampling – Simple random sampling, stratified random sampling, systematic sampling – sampling errors.					
		Unit-II Vital statistics – Definition – Methods Fertility – crude birth rate, specific birth rate, general birth rate, total fertility rate, gross reproduction rate and Net reproduction rate – problems. Mortality – crude death rate, SDR life table – uses – problems.					
		Unit-III Eigen values and Eigen vectors – power of matrix, Inverse of matrix – Cayley Hamilton – theorem (without proof) – simple problems .					
		Unit-IV Algebra – Binomial theorem – Expansion of rational fractions, summation of the series, approximation. Exponential series – expansion – summation of the series, logarithmic series – summation of the series– simple problems.					
		Unit-V Matrices – Definition, Types of Matrices – Operations on matrices, Hamilton matrix, Orthogonal matrix, Rank of matrix. System of linear equations – Consistency – non-homogeneous linear					

CONTROLLER OF EXAMINATIONS

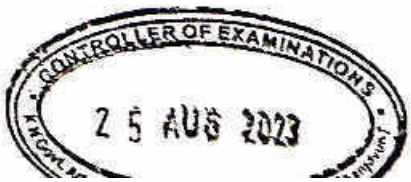
	equations, homogeneous linear equations, simple problems.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Duraipandian, P. and Udaya Baskaran, S. (2014): Allied Mathematics, Vol. – I&II,S. Chand& Company Pvt. Ltd. 2. Vittal, P.R(2012). Allied Mathematics, Margham Publications. 3. Narayanan,S ManickavachagamPillai(1993): Ancillary Mathematics, Book II : (Containing Differential Calculus) S. Viswanathan Pvt, Ltd .
Reference Books	1. Narayanan,S and ManickavachagamPillai (1993): Ancillary Mathematics (Vol. II,Part I) : (Containing Trignometry) S. ViswanathanPvt. Ltd . 2. Narayanan, S and ManickavachagamPillai (1993): Ancillary Mathematics, Book I : (Containing Algebra). S. Viswanathan Pvt.Ltd . 3. S.J.Venkatesan (2019), Algebra,Sri Krishna Publications ,Chennai-77 , skhengg1999@gmail.com
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome(for Mapping with POs and PSOs)

Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.



CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.

CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statistics as a mathematical science

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
- AUG 2023
Govt. Arts College for Women (Autonomous) Thanjavur

Title of the Course	SEC – I Basic of Statistics – I						
Paper Number							
Category	Core	Year	I	Credits	2	Course Code	23K1SSEC1
		Semester	I				
Instructional Hours per week	Lecture	Tutorial		Lab Practice		Total	
	2	-		--		2	
Pre-requisite	Uses and its basics						
Objectives of the Course	1. To enable the students to understand the basic concepts of statistics, collection of data, presentation of data and analysis of data. 2. To acquire knowledge of statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.,						
Course Outline	**Unit I Introduction Meaning and Scope** Statistics – Definition – Scope – Limitations – Population and Sample – Concepts of Random sampling and Non-random sampling – Basic concepts only.						
	Unit II Collection of Data Primary and Secondary data – Methods of collecting primary and secondary data - sources of data – Preparation of Questionnaire and Schedule.						
	Unit III Presentation of Data Classification of data – Types – Frequency distributions for discrete and continuous data – Construction of tables with one, two factors of classification.						
	Unit IV Diagrammatic Representation of Data Bar Diagrams: Types of one dimensional and two dimensional bar diagrams - Pie-diagrams – Uses.						
	Unit –V Graphical Representation of Statistical Data Histogram – Frequency Polygon – Frequency curve and Cumulative frequency curve – Ogive curves – Lorenz curve – Uses.						
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)						
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill						

CONTROLLER OF EXAMINATIONS

25 AUG 2023

Reference Books	1.Gupta. S. P. (2001), Statistical methods, Sultan Chand & Company Ltd., New Delhi. 2.Pillai. R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi. 3.Sancheti. D. C. and Kapoor. V. K, Statistics (7th Edition), Sultan Chand & Sons, New Delhi. 4. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 5. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. Vittal P. R, Business Statistics, Margham Publications, Chennai. 6. Shukla M. C and Gulshan S. S, Statistics, Sultan Chand & Sons, New Delhi. 7. Simpson G and Kafka F, Basic Statistics, Oxford and IBH, Calcutta. 8. Freud J. E, Modern Elementary Statistics, Prentice Hall of India, New Delhi. 9. Saxena H. C (1983), Elementary Statistics, Sultan Chand & Sons, New Delhi.
Website and e-Learning Source	❖ https://www.tutorialspoint.com/statistics/ ❖ https://www.emathzone.com/tutorials/basicstatistics/collection-of-statistical-data.html ❖ https://byjus.com/commerce/meaning-and-objectives-ofclassification-of-data/ ❖ https://byjus.com/commerce/diagrammatic-presentation-ofdata/ ❖ https://byjus.com/maths/graphical-representation/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO -1 Distinguish between population and sample.

CLO-2 Know the concepts of random sampling and non – sampling

CLO-3 Frame a questionnaire and collect primary and secondary data.

CLO-4 Easy to understand the basic concepts.

CLO-5 Analyze statistical data and draw graphs, histograms, frequency polygons and Ogives.

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statistics.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
05 AUG 2023
H.H.G.Govt. Arts College for Women (Autonomous), Thanjavur-1

Title of the Course	**Foundation Course – Elementary Statistics (Bridge)**						
Paper Number							
Category	Core	**Year**	I	**Credits**	2	**Course Code**	23K1SFC
		Semester	I				
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		2	-		–	2	
Pre-requisite	Uses and its basics						
Objectives of the Course	1.To enable the students to understand the basic concepts of set theory. 2.Appreciate the basics of functions and relations. 3.Understand the types of functions and relations. 4.To acquire knowledge the Sequence and series of Arithmetic and Geometric. Find useful applications in commercial problems among others. 5.To know the difference between permutation and combination for the purpose of arranging different objects.						
Course Outline	**Unit – I** Set Theory – Subset, Types of Sets, Relations, Functions – Simple problems.						
	Unit – II Sequence and Series of Arithmetic and Geometric Progressions – Introduction to Sequence, Series, Arithmetic Progression , Geometric Progression – Simple Problems.						
	Unit – III Basic Concepts of Permutations & Combination – Fundamental Principles of Counting, Factorial, Permutations, Circular Permutations, Permutation with Restrictions, Combinations – Simple Problems.						
	Unit – IV Logical Reasoning – Number Series, Coding and decoding and odd man out.						
	Unit – V Statistics – Importance of statistics, concept of statistical population and a sample – quantitative and qualitative data. Collection of primary and secondary data, Measurement scales – nominal, ordinal interval and ratio.						
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved.						

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H.Govt. Arts College for Women (Autonomous)

Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Reference Books	1. V.K. Kapoor and S.C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi. 2. Charles C.Pinter : A Book of Set Theory –Dover Publications, Inc, Mineola, New York. 3. Dr. R.S. Aggarwal : A Modern Approach to Logical Reasoning, Sultan & Chand - 2018.
Website and e-Learning Source	https://www.icai.org/post.html?post_id=17790

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 : Describe the rule that definition, relations and functions of set theory.

CLO-2 : To develop the skill of computation with real sequences and series.

CLO-3 : Students should be able to determine the number of outcomes in a problem.

CLO-4 : Students should be able to apply the fundamental principle of counting to find out the total number of outcomes in problem.

CLO-5 :Understand of data and its relevance in business and develop an understanding of quantitative techniques. **CLO-6** :Ability to apply in data.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CONTROLLER OF EXAMINATIONS
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K.N. Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Matrix and Linear Algebra					
Paper Number		Core III					
Category	Core	Year	I	Credits	5	Course Code	23K2S03
		Semester	II				
Instructional Hours Per week		Lecture	Tutorial		Lab Practice	Total	
		4	1		--	5	
Pre-requisite		Basic vector and matrix theory					
Objectives of the Course		The main objectives of this course are: 1. To study the basic operations of transpose and inverse of matrices 2. To know the structure of orthogonal and unitary matrices 3. To learn the invariance properties of ranks 4. To know and to apply the concepts of vector space and matrix polynomials.					
Course Outline		**Unit I** Matrices-Transpose-Conjugate transpose- Reversal law for the transpose and conjugate transpose. Adjoin of a matrix, Inverse of a matrix, Singular and Non -Singular matrices,					
		Unit II Reversal law for the inverse of product of two matrices. Commutatively of inverse and transpose of matrix, Commutatively of inverse and conjugate transpose of matrix, Orthogonal and Unitary Matrices, Product of unitary matrices, Partitioning of matrices.					
		Unit III Rank of a matrix, Echelon form, Rank of transpose, Elementary transformations, Elementary matrices, Invariance of rank through elementary transformations, Reduction to Normal form, Equivalent matrices.					
		Unit-IV Vector space – Linear Dependence - Basis of a vector space –Sub-space - Properties of Linearly Independent and Dependent systems, Row and Column spaces, Equality of Row and Column ranks, Rank of Sum and Product of matrices					
		Unit-V Matrix polynomials, Characteristic roots and vectors, Relation between characteristic roots and characteristic vectors, Algebraic and Geometric multiplicity, Nature of characteristic roots in case of special matrices, Cayley- Hamilton theorem.					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)		Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					

CONTROLLER OF EXAMINATIONS
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Recommended Text	1. Vasishtha.A.R (1972) : Matrices, Krishnaprakashan Mandir, Meerut.
Reference Books	1. Shanthinarayan, (2012) : A Text Book of Matrices, S.Chand & Co, New Delhi 2. M.L.Khanna (2009), Matrices, Jai PrakashNath & Co
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject https://samples.jbpub.com/9781556229114/chapter7.pdf https://www.vedantu.com/maths/matrix-rank https://textbooks.math.gatech.edu/ila/characteristic-polynomial.html https://www.aitude.com/explain-echelon-form-of-a-matrix/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Do basic operations of matrices

CLO-2 Understand various transactions of matrices and its applications

CLO-3 Understand various properties of matrices

CLO-4 Able to understand vector space and its applications

CLO-5 Able understand Eigen vector and its applications

CLO-6 Able understand vector and matrix applications

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	M	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	M	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
- AUG 2023
A.N. Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Distribution Theory**					
Paper Number		**Core IV**					
Category	Core	**Year**	I	**Credits**	3	**Course Code**	23K2S04
		Semester	II				
Instructional Hours Per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		4	1		–	3	
Pre-requisite		Calculus					
Objectives of the Course		The main objectives of this course are: 1.To learn discrete distributions 2. To learn continuous distributions 3. to understand Distributions generated from mathematical functions 4. learn normal distribution and its properties 5. understand about sampling distributions					
Course Outline		**Unit I** Binomial distribution – moments, recurrence relation, mean deviation, mode, moment generating function, characteristic function, cumulants. Fitting of Binomial Distribution. Poisson distribution – moments, mode, recurrence relation, moment generating function, characteristic function, cumulants. Fitting of Poisson distribution. Negative binomial distribution – m.g.f., cumulants. Fitting of Negative binomial distribution.					
		Unit II Geometric distribution – lack of memory, moments, m.g.f.- Hypergeometric distribution – mean, variance, approximation to Binomial, recurrence relation – Multinomial distribution – m.g.f., mean and variance.					
		Unit III Normal Distribution – chief characteristics of the normal distribution and normal probability curve, mean, median, mode, m.g.f. characteristic function, moments, points of inflexion, mean deviation, Area property – Rectangular distribution – moments, m.g.f., characteristic function, mean deviation about mean.					
		Unit-IV Exponential distribution – m.g.f., characteristic function, memory less property – Gamma distribution – m.g.f., cumulants and central moments, reproductive property – Beta distribution – First kind and second kind – constants.					
		Unit-V Functions of Normal random variables leading to t, Chi-square and F-distributions (derivations, properties and interrelationships).					

Extended Professional Component (is a part of Internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Gupta, S.C. Kapoor, V.K. (2007) Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi 2. Goon, A.M. Gupta M.K. and Das Gupta B (1977) An Outline of Statistical Theory, Vol I, 6/e, World Press, Calcutta. 3. Hogg, R.V. and Craig, A.T. (1978) : Introduction to Mathematical Statistics, 4/e, Mc.Graw Hill Publishing Co.Inc., New York.
Reference Books	1. Mood, A.D. Graybill, F.A. and Boes, D.C (1974): Introduction to the Theory of Statistics, 3/e, Mc.Graw Hill, New York.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome(for Mapping with POs and PSOs) Students will be able to

CLO-1identify discrete distributions appeared in real life situations

CLO-2understand some continuous distributions and its applications

CLO-3connection between some of the real values mathematical functions and its application in distribution theory

CLO-4 understand normal distribution and its properties

CLO-5 understand sampling distributions and its applications in real life

CLO-6identify probability models in real data and estimate population parameters

CONTROLLER OF EXAMINATIONS
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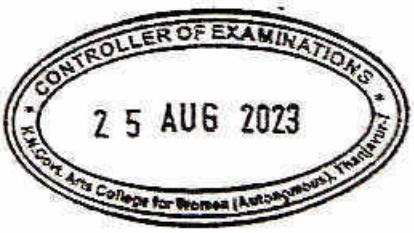
Govt. Arts College for Women (Autonomous), Thanjavur

Title of the Course		Practical - I (Descriptive Statistics And Distribution Theory)					
Paper Number		Elective – II					
Category	Core	Year	I	Credits	2	Course Code	23K2SSEC2P
		Semester	I				
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		2	2		–	4	
Pre-requisite		Basic arithmetic					
Objectives of the Course		The main objectives of this course are: 1. It explains the important concepts of statistics and statistical data. 2. It provides to formulate the visualization of frequency distribution. 3. Also they measure the averages, dispersions, lack of symmetry, moments, relationship among variables. 4. Estimate and predict the unknown and future values. 5. Study of non-linear and consistency of the data.					
Course Outline		**Unit-I** Measures of Central tendency: Mean-Median-Mode-Geometric mean-Harmonic Mean. Measures of Dispersion: Quartile deviation - Mean deviation Standard deviation - Co-efficient of variation.					
		Unit-II Skewness: Karl Pearson's – Bowley's - Kelly's methods Kurtosis: Moments: Raw, Central moments and their relations.					
		Unit-III Correlation analysis: Rank correlation – Partial and Multiple correlations - Regression analysis: Regression Equations -Multiple regression. Association of attributes-Yule's coefficient and - Coefficient of Colligation.					
		Unit-IV Fitting of Binomial Distribution. Fitting of Poisson distribution. And Rectangular distribution Negative binomial distribution – m.g.f., cumulants. Fitting of Negative binomial distribution. Fitting of Geometric distribution.					
		Unit-V Fitting of Exponential distribution . Fitting of Gamma distribution and Beta distribution – First kind and second kind – constants. Fitting of Hypergeometric distribution – mean, variance, approximation to Binomial distribution. Fitting of Normal Distribution.					



Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various Competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill
Recommended Text	1. Gupta, S.P. (2017): Statistical Methods, Sultan Chand & Sons Pvt. Ltd, New Delhi, 35th Revised Edition. 2. Gupta S.C and Kapoor, V.K. (2000). Fundamentals of Mathematical Statistics, Sultan Chand & Sons Pvt. Ltd., New Delhi 3. Gupta, S.C. Kapoor, V.K. (2007) Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi 4. Goon, A.M. Gupta M.K. and Das Gupta B (1977) An Outline of Statistical Theory, Vol I, 6/e, World Press, Calcutta. 5. Hogg, R.V. and Craig, A.T. (1978): Introduction to Mathematical Statistics, 4/e, Mc.Graw Hill Publishing Co.Inc., New York.
Reference Books	1. Goon A.M. Gupta. A.K. and Das Gupta, B (1987): Fundamental of Statistics, vol.2 World Press Pvt. Ltd., Kolkatta 2. G.U.Yule and M.G. Kendall (1956). An introduction to the theory of Statistics, Charles Griffin. 3. Mood, A.D. Graybill, F.A. and Boes, D.C (1974): Introduction to the Theory of Statistics, 3/e, Mc.Graw Hill, New York.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject https://en.wikipedia.org/wiki/Statistics https://en.wikipedia.org/wiki/Descriptive_statistics e-books, tutorials on MOOC/SWAYAM courses on the subject

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Course Learning Outcome(for Mapping with POs and PSOs) Students will be able to

CLO-1identify discrete distributions appeared in real life situations

CLO-2understand some continuous distributions and its applications

CLO-3connection between some of the real values mathematical functions and its application in distribution theory

CLO-4 understand normal distribution and its properties

CLO-5 understand sampling distributions and its applications in real life

CLO-6identify probability models in real data and estimate population parameters

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	M	M	S	M
CLO4	S	S	S	M	S	S	S	M	M
CLO5	S	M	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N. Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Real Analysis**					
Paper Number		**Elective – III (Discipline specific)**					
Category	Core	**Year**	I	**Credits**	3	**Course Code**	23K2SECS3:1
		Semester	II				
Instructional Hours Per week		**Lecture**		**Tutorial**		**Lab Practice**	**Total**
		4		-		--	4
Pre-requisite		Number theory and Arithmetic					
Objectives of the Course		The main objectives of this course are: 1. To study the basic operations of sets and functions 2. To know the structure of the real sequence and its convergence 3. To learn series and its convergence 4. To learn the limits, continuity and derivative of real valued functions 5. To know and to apply the Riemann integration					
Course Outline		**Unit I** Operations on sets, Functions, Real valued functions, Equivalence, Count ability, Real Numbers, Cantor set, Least Upper Bounds, Greatest Lower Bound.					
		Unit II Definition of Sequence, Sub sequence, Limit of a sequence, Convergent and Divergent sequences, Oscillating sequence, Bounded and Monotone sequences, Operations on convergent sequences, Limit Infimum, Limit Supremum, Cauchy sequences, Sum ability of sequences.					
		Unit III Definition of Series, Convergent and Divergent series, series with nonnegative terms, alternating series, conditional convergence, absolute convergences and test for absolute convergence					
		Unit-IV Limit of a function on the real line, Increasing and Decreasing functions, Continuous function, Operations on continuous functions, Composition of continuous functions, Derivatives, Derivative and continuity, Rolle's Theorem, Mean value theorem, Taylor's theorem					
		Unit-V Concept of Riemann Integral, Refinement of partition, Upper and Lower sums, Upper integral and Lower Integral Riemann integrability, Necessary and Sufficient condition for Riemann integrable, Properties of Riemann integrals, Fundamental theorem					

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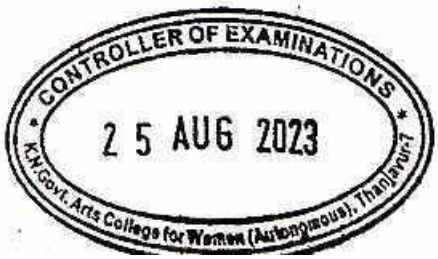
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Goldberg .R R(1976) : Methods of Real Analysis, Oxford &IBH.
Reference Books	1. Shanthinarayan, (2012) : Real Analysis, S.Chand& Co, New Delhi 2. Walter Rudin (2017), Principles of Mathematical Analysis, 3rd Edition, McGraw-Hill
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject https://tutorial.math.lamar.edu/classes/calci/thelimit.aspx https://www.mathsisfun.com/calculus/derivatives-introduction.html https://www.math.ucdavis.edu/~hunter/m125b/ch1.pdf https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/single-variable-calculus/taylors-theorem/ http://www.ms.uky.edu/~droyster/courses/fall06/PDFs/Chapter06.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1do basic operations of sets and understand set functions
CLO-2understand sequence and its convergence
CLO-3understand series and its convergence
CLO-4 identify real valued functions and its discontinuity
CLO-5 understand integration concepts
CLO-6understand probability functions as set functions and get knowledge on discrete and continuous nature of it



	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1S	S	M	M	M	S	S	S	M	
CLO2S	S	S	S	M	S	S	S	M	
CLO3S	S	S	M	S	M	S	S	M	
CLO4S	S	S	M	S	S	S	S	M	
CLO5S	S	M	M	M	S	S	S	M	
CLO6S	M	M	S	M	S	S	S	M	

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Fuzzy Set Theory**					
Paper Number		**Elective – III**					
Category	Core	**Year**	I	**Credits**	3	**Course Code**	**23K2SECS3:2**
		Semester	II				
Instructional Hours Per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		3	1		--	4	
Objectives of the Course		The main objectives course are: Fuzzy set theory can be used in the development of intelligent systems for decision making, identification, pattern recognition, optimization, and control.					
Course Out line		**Unit – I** Introduction–Crisp sets: An overview–Fuzzy sets: Basic Types. **Unit – II** Basic concepts–Characteristics and significance of the paradigm shift– Additional properties of α-cuts. **Unit – III** Representations of Fuzzy set–Extension principle for Fuzzy sets – Types of operations. **Unit – IV** Fuzzy complements–Fuzzy Intersections :t-norms- Fuzzy unions; t-conforms. **Unit – V** Combinations of operations–Aggregation operations.					

CONTROLLER OF EXAMINATIONS
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K.N.Govt. Arts College for Women (Autonomous), Thanjavur

Extended Professional Component (is a part of internal component only ,Not to be included in the External Examination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminatio nsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability Professional Competency ,Professional Communication and Transferrable Skill
Recommended Text	1. Georgej.Klir/boyuan,"fuzzysetsandfuzzylo gictheoryandapplication",prenticehallof indiaprivateltd.,newdelhi.2008.
Reference Books	S.Nanda,&N.R.Das,"FuzzyMathematicalConcepts",Naro saPublishingHouse,NewDelhi.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Out come (for Mapping with POs and PSOs)

Students will be able to

CLO-1understand optimization techniques and solving set of equations with constraints

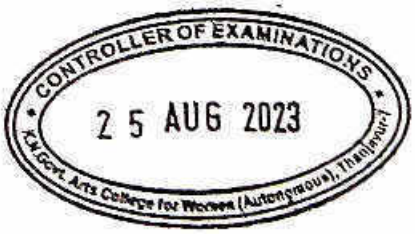
CLO-2solve problems of linear programming

CLO-3understand transportation problems and its applications

CLO-4 solve problems using games theory

CLO-5 do replacement problems and solve it

CLO-6do network analysis and get problem solving skills



Title of the Course		Practical- II (Data Analysis Using MS – Excel)					
Paper Number		SEC-II					
Category	Core	Year	I	Credits	2	Course Code	23K2SSEC2P
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		-		-		2	2

Objectives:

1. To enable the students to gain computer practical knowledge about the concepts of statistics.
2. To apply the measures of descriptive statistics and probability in real life situations using MS excel
3. To provide practical knowledge in random variables, probability distributions, expectation, moment generating function, matrices, Rank of matrices.

Practical Exercises:

1. Computation of Measures of Central Tendency for discrete data using MS Excel (Mean, Median, Mode, Geometric Mean, Harmonic Mean)
2. Computation of Measures of Central Tendency for Continuous data using MS Excel (Mean, Median, Mode, Geometric Mean, Harmonic Mean)
3. Computation of Measures of dispersion for discrete data using MS Excel ()
4. Computation of Measures of dispersion for Continuous data using MS Excel ()
5. Graphical Presentation of data (Histogram, Frequency Polygon, Ogives) Using MS Excel.
6. Computation of Co-efficient of Skewness and Kurtosis – Karl Pearson's and Bowley's data using MS Excel
7. Fitting of Binomial distribution – Direct Method using MS Excel.
8. Fitting of Poisson distribution – Direct Method using MS Excel.
9. Fitting of Exponential distribution – Direct Method using MS Excel.
10. Problems based on univariate probability distributions.
11. Problems based on probability.
12. Calculating Inverse matrix in Excel.
13. Calculating Transpose matrix in Excel.
14. Calculating Rank matrix in Excel.

Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks.

Any 3 questions are to be answered in 3 hours duration out of 5.

Examinations Distribution of Marks

University Examinations (Computer Practical)	75 Marks
CIA (Including Practical Record)	25 Marks
Total	100 Marks

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H. The Rajah's College for Women (Autonomous), Thanjavur-1

25/8/23
HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	SEC – III Basic of Statistics – II						
Paper Number	SEC- III						
Category Core	Year	I	Credits	2	Course Code	23K2SSEC3	
	Semester	II					
Instructional Hours per week	Lecture	Tutorial		Lab Practice		Total	
	2	-		--		2	
Pre-requisite	Statistics and its basics						
Objectives of the Course	1. To enable the students understand and compute the measures of central tendency and dispersion. 2. To learn the concepts of time series, evaluation of trend and measurement of seasonal variations by using various methods. 3. Acquire knowledge about index numbers, cost of living index numbers and calculate an in dices from real life problems.						
Course Outline	Unit I Measures of Central Tendency Definitions and concepts of Arithmetic mean Median and Mode – Merits and Demerits – Uses - Simple Problems.						
	UNIT II Measures of Dispersion Range, Quartile deviation and their relative measures - Standard deviation and Coefficient of variation - Simple Problems.						
	Unit III Correlation Karl Pearson's coefficient of correlation and Spearman's rank correlation coefficient – Simple Problems.						
	Unit IV Time series Measures of trend – Graphic method – Semi average method and Moving average method - Simple Problems.						
	Unit V Index Numbers Un weighted and Weighted Index Numbers: Laspeyre's, Paasche's and Fisher's method – Cost of living index numbers – Simple Problems.						
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill						
	❖ https://byjus.com/maths/central-tendency/ ❖ https://byjus.com/maths/dispersion/ ❖ https://www.bmj.com/about-bmj/resourcesreaders/publications/statistics-square-one/11-correlation-andregression ❖ http://www.stat.columbia.edu/~rdavis/lectures/Session6.pdf ❖ https://www.civilserviceindia.com/subject/Management/notes/indexnumbers.html						

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N. Govt. Arts College for Women (Autonomous), Thanjavur

Title of the Course		**Estimation Theory**					
Paper Number		**Core – V**					
Category	Core	**Year**	II	**Credits**	3	**Course Code**	23K3S05
		Semester	III				
Instructional Hours Per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		2	1	--	3		
Pre-requisite		Number theory and Arithmetic					
Objectives of the Course		The main objectives of this course are: 1. To Emphasize on the Concept of Point Estimation and Interval Estimation. 2. To learn properties of a good estimator 3. To understand various methods of estimation					
CourseOutline		**Unit I** Point estimation – Estimator – Consistency and Unbiasedness – Efficiency and asymptotic efficiency – Estimators based on sufficient statistics – Neyman Factorization theorem (statement only) – Simple illustrations					
		Unit II Minimum variance unbiased estimators – Cramer – Rao Inequality – Rao Blackwell theorem – Simple illustrations					
		Unit III Methods of Estimation – Methods of Maximum likelihood and moments – Properties of estimators obtained by these methods – Simple illustrations					
		Unit-IV Method of Minimum Chi-Square-Method of Minimum Variance-Methods of moments -Methods of Least squares- Interval estimation.					
		Unit-V Notion of Bayes estimation – concept of prior, posterior and conjugate priors. Simple problems involving quadratic error loss function – Notion of Minimax estimation – Simple illustrations.					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving ,Analytical ability, Professional Competency, ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Gupta S.C. and Kapoor V.K. (2007) : Fundamentals of Mathematical Statistics, Sultan Chand Sons, New Delhi. 2. P.R. Vittal(2002) : Mathematical Statistics, Margham Publications, Chennai. 3. Ashok K. Bansal(2007): Bayesian Parametric Inference, Narosa Publishing House. 4. Mood, A.M. Graybill, F.A. and Boes D.C. (1974): Introduction to Theory of Statistics, McGraw – Hill.
Reference Books	1. Rohatgi, V. (1976) : An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern. 2. Goon A.M. Gupta M.K. and Das B. (1980): An Outline of Statistical Theory, Vol II, World Press, Calcutta 3. Sanjay Arora and Bansi Lal (1989) : New Mathematical Statistics, Satya Prakasam, New Delhi. 4. Hodges, J.L. and Lehman, E.L (1964): Basic Concepts of Probability and Statistics, Holden Day. 5. Dr. A. Santhakumaran(2004): Probability Models and their Parametric Estimation
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1estimate population parameters

CLO-2identify good estimators and its properties

CLO-3derive interval estimators of a parameter

CLO-4 estimate parameters using various estimation methods and identify the best among the estimators

CLO-5 handle data and can estimate population parameters

CLO-6 realize the application of different types of estimators.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	S	S	M
CLO2	S	S	S	S	M	S	S	S	M
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

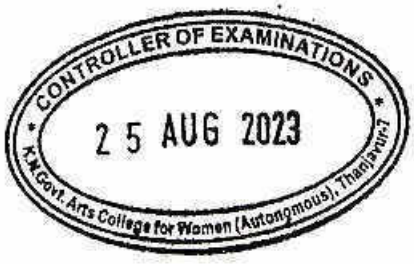
Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N. Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

<table>
<tr><td colspan="2">TitleoftheCourse</td><td colspan="6">Sampling Techniques</td></tr>
<tr><td colspan="2">PaperNumber</td><td colspan="6">Core – VI</td></tr>
<tr><td>Category</td><td>Core</td><td>Year</td><td>II</td><td>Credits</td><td>5</td><td>Course Code</td><td>23K3S06</td></tr>
<tr><td colspan="2"></td><td>Semester</td><td>III</td><td colspan="4"></td></tr>
<tr><td colspan="2">InstructionalHours perweek</td><td>Lecture</td><td>Tutorial</td><td>LabPractice</td><td colspan="3">Total</td></tr>
<tr><td colspan="2"></td><td>4</td><td>1</td><td>--</td><td colspan="3">5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">Descriptive statistics and Probability theory</td></tr>
<tr><td colspan="2">Objectives of theCourse</td><td colspan="6">Themain objectives ofthis courseare:
1. To know the basic operations of sampling
2. To study the theory and applications of SRS
3. To learn practical uses of Stratification
4. To apply Systematic and PPS Sampling in real time problems.</td></tr>
<tr><td colspan="2">CourseOutline</td><td colspan="6">Unit I
Basic concepts of sample surveys – Advantages of Sampling –Principal steps in Sample survey, Sampling unit – Sampling frame – Census – Probability Sampling, Alternatives to probability sampling, Mean Square Error.</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit II
Simple random sampling, Methods of selection, Sampling with and without replacement – Properties of estimates, Finite population correction, Estimation of Standard error, Confidence limits – Simple random sampling for Qualitative characteristics, Sample size determination for proportions and continuous data. Design effect.</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit III
Stratified random sampling, principles of stratification, Notations – Estimation of population mean and its variance – Estimated variance and confidence limits, Allocation techniques - equal allocation, proportional allocation, Neyman allocation and optimum allocation, Estimation of gain due to stratification.Estimation of sample size for continuous data.</td></tr>
<tr><td colspan="2"></td><td colspan="6">Unit-IV
Systematic sampling –Relation to cluster sampling, Estimation of population mean and its sampling variance – Comparison of systematic sampling with stratified random samples.Systematic</td></tr>
</table>

	sampling in two dimensions.
	Unit-V Varying Probability sampling, Selection of one unit with PPS, PPS Sampling with replacement, Estimator for population total and its variance, Selection procedures, Cumulative total method, Lahiri's method, Split method.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis Course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Cochran, W.G. (1978) : Sampling Techniques, John Wiley Eastern 2. Murthy M.N. (1967):Sampling Theory and Methods, Statistical Publishing Society, Calcutta
Reference Books	1. Singh. D. and ChaudryF.S. (1986) : Theory and Analysis of Sample Surveys Design Wiley Eastern Ltd. 2. Sampath.S, (2001), Sampling Theory and Methods, CRC Press.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject http://ocw.jhsph.edu/courses/statmethodsforsamplesurveys/pdfs/lecture2.pdf https://www.questionpro.com/blog/stratified-random-sampling/ https://www.scribbr.com/methodology/systematic-sampling/ http://home.iitk.ac.in/~shalab/sampling/chapter7-sampling-varying-probability-sampling.pdf



CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1 Know the difference between census and sampling.
CLO-2 Understand basic operations and advantages of sampling
CLO-3 Understand widely used sampling techniques
CLO-4 Know to estimate population information using sampling
CLO-5 Apply sampling techniques in real time problems
CLO-6 identify suitable sampling technique for a real life survey

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	S	S	M
CLO2	S	S	S	S	M	S	S	S	M
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

TitleoftheCourse	Numerical Methods						
PaperNumber	Elective – IV (Discipline Specific)						
Category Core	Year	II	Credits	4	Course Code	23K3SECS4:1	
	Semester	III					
InstructionalHours perweek	Lecture	Tutorial		LabPractice	Total		
	4			--	4		
Pre-requisite	Basic Arithmetic and calculus						
Objectives of theCourse	Themain objectives ofthis courseare: 1. To introduce the study of algorithms that used numerical approximation for the problems of Mathematical analysis. 2. To solve mathematical problems numerically						
CourseOutline	Unit I The Solution of Numerical Algebraic and Transcedental Equations:Bisection Method, Iteration Method, Regula Falsi Method, Newton – Raphson Method. Hornor's Method						
	Unit IISolution of Simultaneous Linear Algebraic Equations:Guass – Elimination Method, Guass–Jordan Method, Guass – Jacobi Method, Guass –Seidel Method. Finite Differences: Operators.Interpolation for Equal intervals: Newton's Forward Interpolation Formula and Newton's Backward Interpolation Formula, Evaluation of missing terms.						
	Unit III Central Difference Interpolation Formula For Equal Intervals: Guass Forward Interpolation Formula,Gauss Backward Interpolation Formula, Sterlings Formula, Bessel's Formula, Laplace- Everett's Formula.						
	Unit-IVInterpolation with Unequal Intervals: Divided Differences, Newton's Divided Differences Interpolation Formula, Lagrange's InterpolationFormula and Inverse Lagrange's Interpolation, Method of reversal of series.						
	Unit-V Numerical Differentiation: Numerical Differentiation based on Newton's Forward and Backward Interpolation Formula – Computation of Second order derivatives. Numerical Integration:General Quadrature formula for equidistant ordinates, Trapezoidal Rule,Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$						

	Rule and Weddle's Rule. Numerical Solution of Ordinary Differential Equations:Taylor Series Method, Picard's Method and Runge – Kutta Method. (Simple Problems Only Without Derivation)
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis Course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Kandasamy, P., Thilagavathy, K. (2003): Calculus of Finite Differences and Numerical Analysis, S.Chand Publications. 2. Balasubramaniam and Venkatraman(1972): Numerical mathematics part I and II by Rochouse and Sons
Reference Books	1. Kalavathy, S., and Thomson. (2004): Numerical Methods, Vijay Nico::le Publications. 2. Gupta, B.D. (2004): Numerical Analysis, Konark Publications. 3. Venkatachalapathy, S.G. (2004): Calculus of Finite Differences and Numerical Analysis, Margam Publications. 4. Gerald Wheatley, (1970): Applied Numerical Analysis, Pearson Education Publications. 5. Jain, M.K., Iyengar, S.R., Jain, R.K., (1994): Numerical Methods Problems and Solutions, New Age International Publishers.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject www.nptel.com

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1 Solve numerically equations that cannot have direct solution
CLO-2solve system of linear equations
CLO-3understand the need of interpolation
CLO-4 handle numerical differentiation
CLO-5 do integration numerically
CLO-6 get a foundation on algorithms to solve a mathematical problem

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	S	S	M
CLO2	S	S	S	S	M	S	S	S	M
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Financial Statistics					
Paper Number		SEC IV					
Category	Core	Year	II	Credits	4	Course Code	23K3SECS4:2
		Semester	III				
Instructional Hours Per week		Lecture	Tutorial		Lab Practice	Total	
		4	-		--	4	
Pre-requisite		Probability theory					
Objectives of the Course		The main objectives of this course are: 1. To study the basic concepts of theory of Stochastic Processes, the most important types of Stochastic Processes, various properties and characteristics (Poisson, Morkov and others). 2. To learn the notions of ergodicity, stationarity and applications.					
Course Out line		**UNIT I** Probability review: Real valued random variables, expectation and variance, skewness and kurtosis, conditional probabilities and expectations. Discrete Stochastic Processes, Binomial processes, General random walks, Geometric random walks, Binomial models with state dependent increments.					
		UNIT II Tools Needed For Option Pricing: Wiener process, stochastic integration, and stochastic differential equations. Introduction to derivatives: Forward contracts, spot price, forward price, future price. Call and put options, zero-coupon bonds and discount bonds.					
		UNIT III Pricing Derivatives: Arbitrage relations and perfect financial markets, pricing futures, put-call parity for European options, relationship between strike price and option price. Stochastic Models in Finance: Discrete time process- binomial model with period one.					
		UNIT IV Stochastic Models in Finance: Continuous time process-geometric Brownian motion. Ito's lemma, Black-Scholes					

	differential equation, Black-Scholes formula for European options, Hedging portfolios: Delta, Gamma and Theta hedging. Binomial Model for European options: Cox-Ross-Rubinstein approach to option pricing. Discrete dividends.
	UNIT V Solution of Simultaneous Linear Algebraic Equations:Guass – Elimination Method, Guass–Jordan Method, Guass – Jacobi Method, Guass –Seidel Method. Finite Differences: Operators. Interpolation for Equal intervals: Newton's Forward Interpolation Formula and Newton's Backward Interpolation Formula, Evaluation of missing terms.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Medhi, J. (2019): Stochastic Processes, New Age International Publishers. 2. KantiSwarup, Gupra.P.K. Man Mohan.,(2010): Operations Research, Sultan Chand & Sons
Reference Books	1. Franke, J., Hardle, W.K. And Hafner, C.M. (2011): Statistics of Financial Markets: AnIntroduction, 3rd Edition, Springer Publications. 2. Stanley L. S. (2012): A Course on Statistics for Finance, Chapman and Hall/CRC.
Website and e-Learning Source	

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

CLO-1 Understand stochastic nature of random variable and different stochastic process

CLO-2know about transition matrix and its calculations

CLO-3understand Markov chain and its applications

CLO-4 understand Markov process and its applications

CLO-5 unserstandrenewel process and its applications

CLO-6know about various stochastic modeling and its applications

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	M	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	M	S	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Practical – IV (Calculator Based Sampling Techniques)					
Paper Number		SEC – IV (Discipline specific)					
Category	Core	Year	II	Credits	2	Course Code	23K3SSEC4P
		Semester	III				
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		2		-	–	2	
Objectives of the Course		The main objectives of this course are: 1. To enable the students to gain practical knowledge of estimation of parameters and its interval. 2. To know the basic operations of sampling 3. To study the theory and applications of SRS 4. To learn practical uses of Stratification 5. To apply Systematic and PPS Sampling in real time problems.					
Course Outline		Unit I Estimation of parameters of statistical model – Multinomial distribution, exponential, binomial and Poisson distribution –Construction of Confidence intervals for mean and variance					
		Unit II Method of maximum likelihood and method of moments.					
		Unit III Simple random Sampling Drawing Sample from the Population with and without Replacement – Estimation of Population Mean, Total Variance and its Standard Error.					
		Unit IVStratified random Sampling Estimation of Mean, Variance of the Population Means – Variance of the estimator of Mean under Proportional and Optimal allocations.					
		Unit V Systematic random sampling Estimation of Mean and Variance – Comparison of Simple Random Sampling, Stratified Random Sampling and Systematic Random Sampling.					

Note:

Question Paper Setting:

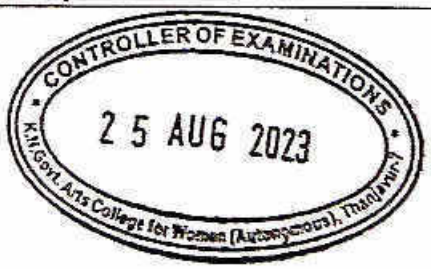
5 questions are to be set without omitting any unit. All questions carry equal marks.
Any 3 questions are to be answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	75 Marks
CIA (Including Practical Record)	25 Marks
Total	100 Marks

CONTROLLER OF EXAMINATIONS
25 AUG 2023
KN Govt. Arts College for Women (Autonomous), Thanjavur-1

Title of the Course	Database Management System						
Paper Number	SEC – V						
Category: Core	Year: II Semester: III	Credits: 1			Course Code: 23K3SSEC5		
Instructional Hours per week	Lecture: 1	Tutorial: -	Lab Practice: –	Total: 1			
Pre-requisite							
Objectives of the Course	1. Understand the basic concepts and applications of database systems. 2. Master the basics of SQL and construct queries using SQL. 3. Understand the relational database design principle.						
Course Outline	Unit I Introduction – Database System Application – Purpose of Database Systems – View of Data – Database Languages – Transaction Management – Database Architecture – Database users and Administrators.						
	UNIT II Relational Model : Structure of Relational Database – Database Design – ER Model – SQL : Background – Data definition – Basic Structure of SQL – Queries – Set Operations – Aggregate Functions – Null Values – Nested Sub Queries.						
	Unit III Intermediate SQL : Join Expressions – View – Transactions – Authorization – Advance SQL : Functions and Procedures – Triggers						
	Unit IV PL/SQL : Programming Language: Fundamentals – Block Structure – Comments – Data Types – Declaration – Assignment operation – Bind Variables – Substitution Variables – Printing Operators.						
	Unit V PL/SQL Composite Data types: Records – Tables – V Arrays. Named Blocks : Procedures – Functions – Packages – Triggers – Data Dictionary Views.						
Reference Books	1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S.Sudharshan, TMH – 5th Edition 2. " Fundamentals of Database Management Systes", Alexis Leon, Mathews Leon, Vijay Nicole Imprints Private Limited. 3. "Database Systems Using Oracle", Nilesh Shah, 2nd Edition, PHI .						
Website and e-Learning Source	1. https://www.w3schools.com/sql 2. https://www.tutorialspoint.com/sql 3. https://livesql.orcale.com						



Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Demonstrate the basic elements of a relational database management system

CLO-2 Identify the data models for relevant problems.

CLO-3 Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data..CLO-4 Demonstrate their understanding of key notions of query evaluation and optimization techniques.

CLO-5 Extend normalization for the development of application software's

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-1

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Kunthavai Naachiyaar Govt. Arts College (W) Autonomous,
Thanjavur

23K3SECC1:1
Credit -3

B.Sc., Statistics
Self Study Course – I
Competitive Exam Skills
(Contents in Tamil)

UNIT – I

(i). இலக்கணம்

இலக்கணம் - பொருத்துதல் - பிரித்து எழுதுதல் - எதிர்சொல் - பிழைதிருத்தம் - ஆங்கில சொல்லுக்கு நேரான தமிழ் சொல் அறிதல் - அடையரிசைப்படி எழுதுதல் - இலக்கணக் குறிப்பு அறிதல் - வினையின் வகைகள் - உவமையால் பொருத்தமான பொருளைத் தேர்ந்தெழுதுதல் - தொகை, மோனை, இயைபு.

(ii). இலக்கியம்

திருக்குறள் (பத்தொன்பது அதிகாரங்கள் மட்டும்) – அறநூல்கள் தொடர்பான செய்திகள் - கம்பராமாயணம், புறநானூறு, அகநானூறு – தொடர்பான செய்திகள் - சிலப்பதிகாரம், ஐஞ்சிறு காப்பியம் - பெரியபுராணம், சிற்றிலக்கியம், மனோன்மணியம், நாட்டுபுறபாட்டு மற்றும் சமய முன்னோடிகள் பற்றிய செய்திகள்.

UNIT – II

தமிழ் அறிஞர்கள் ஆற்றிய தொண்டு, இயல், இசை, நாடகம் மற்றும் உரைநடை பற்றிய செய்திகள்.

UNIT – III

பொது அறிவியல

(i) , இயற்பியல்

பொது அறிவியல் விதிகள் - தேசிய அறிவியல் ஆராய்ச்சிக் கூடங்கள் - பருப்பொருளின் பண்புகளும், இயக்கங்களும் - இயற்பியல் அளவுகள், அளவீடுகள் மற்றும் அலகுகள் - விசை, இயக்கம் மற்றும் ஆற்றல் - காந்தவியல், மின்சாரவியல் மற்றும் மின்னணுவியல் - வெப்பம், ஒளி மற்றும் ஒலி.

(ii) வேதியியல்

தனிமங்கள் மற்றும் சேர்மங்கள் - அமிலங்கள், காரங்கள் மற்றும் உப்புகள் - செயற்கை உரங்கள், உயிர் கொல்லிகள் - நுண்ணுயிர் கொல்லிகள்.

(iii) தாவரவியல்

உயிரினங்களின் பல்வேறு வகைகள் - உணவூட்டம் மற்றும் திட்ட உணவு – சுவாசம்.

(iv) விலங்கியல்

இரத்தம் மற்றும் இரத்த சுழற்சி - இனப்பெருக்க மண்டலம் - மனிதனின் நோய்கள் - பரவும் மற்றும் பரவா நோய்கள் உட்பட- தற்காத்தல் மற்றும் தீர்வுகள் - விலங்குகள், தாவரங்கள் மற்றும் மனித வாழ்வு.

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UNIT – IV

(i) புவியியல்
பூமியும் பேரண்டமும் - சூரிய குடும்பம் - பருவக்காற்று, மழைப்பொழிவு, காலநிலை
மற்றும் தட்பவெப்பநிலை - நீர்வள ஆதாரங்கள் - இந்தியாவிலுள்ள ஆறுகள் -
மண் வளங்கள், கனிமங்கள் மற்றும் இயற்கை வளங்கள் - காடுகள் மற்றும் வன
உயிர்கள் - விவசாய முறைகள்.

(ii), இந்திய அரசியல் : மத்திய மாநில மற்றும் மத்திய ஆட்சிப்பகுதிகள் -
இந்திய அரசியல் அமைப்பு - மனித உரிமை சாசனம் - இந்திய
குடியுரிமை - உரிமைகளும், கடமைகளும் - மாநில சட்டமன்றம் -
நாடாளுமன்றம் - பாராளுமன்றம் - மாநில நிர்வாகம் -
சட்ட சபை - உள்ளாட்சி அரசு - பஞ்சாயத்து ராஜ் - இந்திய தணிக்கை மற்றும்
கணக்காளர் தலைமை - தகவல் அறியும் உரிமை - பெண்கள் முன்னேற்றம் -
நுகர்வோர் பாதுகாப்பு அமைப்புகள்.

(iii), இந்திய பொருளாதாரம் மற்றும் தேசிய இயக்கம் :
இந்திய பொருளாதாரத்தின் இயல்புகள் - ஐந்தாண்டு திட்டங்கள் -
வேளாண்மையில் அறிவியலின் பயன்பாடு — தொழில் வளர்ச்சி — கிராம நலம்
சார்ந்த திட்டங்கள் - சமூகம் சார்ந்த பிரச்சனைகள் - மக்கட்தொகை, கல்வி,
சுகாதாரம், வேலைவாய்ப்பு, வறுமை — தேசிய மறுமலர்ச்சி —
தேசத்தலைவர்களின் எழுச்சி (காந்தி, நேரு, தாகூர்) — பல்வேறு போராட்ட
முறைகள் - சுதந்திர போராட்டத்தில் தமிழ் நாட்டின் பங்கு (இராஜாஜி, வ.உ.சி,
பெரியார், பாரதியார் மற்றும் பலர்)

(iv), இந்தியா மற்றும் தமிழ்நாடு வரலாறு மற்றும் பண்பாடு :
சிந்து சமவெளி நாகரிகம் - குப்தர்கள், டெல்லி சுல்தான்கள், மொகலாயர்கள்
மற்றும் மராட்டியர்கள் - விஜய நகரத்தின் காலம் மற்றும் பாமினிகள் - தென்
இந்திய வரலாறு, பண்பாடு மற்றும் தமிழ் மக்களின் புராதானம் - இந்திய
சுதந்திரம்.

UNIT – V

(i) திறனறிவு மற்றும் புத்திக் கூர்மை தேர்வுகள் :
தகவல்களை விவரங்களாக மாற்றுதல் - விவரம் சேகரித்தல், தொகுத்தல் மற்றும்
பார்வைக்கு உட்படுத்துதல் - அட்டவணைகள், புள்ளி விவர வரைபடங்கள் -
விவர பகுப்பாய்வு விளக்கம் - சுருக்குதல் - சதவிகிதம் - மீப்பெரு பொது
வகுத்தி (ம.பொ.வ) — மீச்சிறு பொது மடங்கு (மீ.பொ.ம) — விகிதம் மாற்று
சரிவிகிதம் - தனிவட்டி - கூட்டுவட்டி — பரப்பளவு — கனஅளவு — நேரம் மற்றும்
வேலை — தர்க்க அறிவு — புதிர்கள் - பகடை — காணொளிதர்க்க அறிவு — எண்
கணிததர்க்க அறிவு — எண் தொடர்கள்.

(ii) நடப்பு நிகழ்வுகள் :
செய்திகளில் இடம் பெறும் புகழ்பெற்ற நபர்கள் மற்றும் இடங்கள் - விளையாட்டு
மற்றும் போட்டிகள் - நூல்களும் நூலாசிரியர்களும் - விருதுகளும் மற்றும்
பட்டங்களும் - இந்தியாவும் அதன் அண்டை நாடுகளும்.

Books for Study :

Unit – I & Unit – II

6-ஆம் வகுப்பு முதல் 10-Mk வகுப்பு வரை உள்ள தமிழ் பாடபுத்தகங்கள்.

Unit – III

6-ஆம் வகுப்பு முதல் 10-ஆம் வகுப்பு வரை உள்ள அறிவியல் பாடபுத்தகங்கள்.

Unit – IV

6-ஆம் வகுப்பு முதல் 10-ஆம் வகுப்பு வரை உள்ள சமூக அறிவியல் பாடபுத்தகங்கள்.

Unit – V

6-ஆம் வகுப்பு முதல் 10-ஆம் வகுப்பு வரை உள்ள கணிதம் பாடபுத்தகங்கள் மற்றும் அன்றாட செய்திதாள்கள்.

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K.N. Govt. Arts College for Women (Autonomous), Thanjavur

HOD i/c STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Computational Statistics(Add on Course)					
Paper Number		ECC II					
Category	Core	Year	II	Credits	4	Course Code	23K3SECC2
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		-		-		-	-

List of Experiments:

1. Entering a letter, aligning, spell check and printing.
2. Creating tables, inserting rows and columns and formatting.
3. Creating main document, data source and using mail merge facility.
4. Prepare frequency distribution using Excel function.
5. Preparing Pie chart and Bar charts.
6. Calculation of Statistical constants using Excel functions.
7. Calculation of correlation and regression Co-efficient.
8. Creating a new presentation in Power Point, numbering and copying slides.
9. Changing fonts and colors, inserting Clip Art and Formatting options. Inserting Bullets and Picture, Creating Tables and Inserting Auto shapes.

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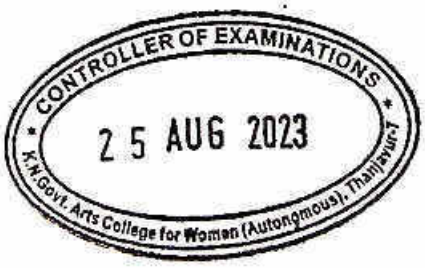
25 AUG 2023
K.M.Govt. Arts College for Women (Autonomous), Thanjavur-1

K.N.G... (W) (AUTO)
THANJAVUR

TitleoftheCourse		Testing of Statistical Hypothesis					
PaperNumber		Core VII					
Category	Core	Year	II	Credits	3	Course Code	23K4S07
		Semester	IV				
InstructionalHours perweek		Lecture	Tutorial		LabPractice	Total	
		2	1		--	3	
Pre-requisite		Estimation theory and distribution theory					
Objectives of theCourse		Themain objectives ofthis courseare: 1. To make familiar with testing concepts 2. To understand the concept of Most Powerful test 3. To understand the Likelihood ratio tests and their uses 4. To apply tests for samples from unknown distributions					
CourseOutline		**Unit I** Statistical Hypothesis – Null and Alternative Hypothesis – Simple and Composite hypothesis – Critical region – Type-I and Type-II error – Most Powerful test – Uniformly Most powerful test – Neyman Pearson Lemma – Simple problems.					
		Unit II Likelihood ratio test – Tests of mean of a normal population – Equality of two means of normal populations – test for variance of a normal population – Equality of variances of two normal populations.					
		Unit III Chi-square tests, Distribution of quadratic forms, Test of equality of several means, Analysis of Variance. Correlation and Regression testing.					
		Unit-IV Exact tests based on t distribution – One sample tests - one sided and two sided tests – Variance known and Variance unknown – Two sample tests – One sided and two sided - Variance known and Variance unknown.					



	Unit-V Nonparametric methods – Confidence interval for distribution quantiles – Tolerance limits for distributions. Sign test, Wilcoxon test.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
SkillsacquiredfromthisCourse	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Robert V. Hogg and Allen T.Craig (1978). Introduction to Mathematical Statistics, 4th edition, Macmillan Publishing Co., Inc. New York 2. An Introduction to Probability and Statistics (2001), Rohatgi.V.K, and A.K.Md.EhsanesSaleh, John Wiley & Sons
Reference Books	1. GuptaS.C. and Kapoor V.K. (1991) : Fundamentals of Mathematical Statistics, Sultan Chand & Sons. 2. Goon A.M. Gupta M.K. and Das Gupta B (1980) : An outline of Statistical Theory, Vol.II World Press Calcutta. 3. Mood A.M. Graybill F.A. and Boes D.C.B (1980) : Introduction to the Theory of Statistics 3/e, McGraw Hill, New York. 4. Gibbons, J.D. (1971) : Non-Parametric Statistical Inference, McGraw Hill.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject http://fisher.stats.uwo.ca/faculty/kulperger/SS3858/Handouts/np-lemma.pdf https://www.sciencedirect.com/topics/mathematics/uniformly-most-powerful-test https://www.probabilitycourse.com/chapter8/8_4_5_likelihood_ratio_tests.php https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/parametric-and-non-parametric-data/

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1framc hypotheses about population in real life research
CLO-2identify suitable testing procedure for given hypotheses
CLO-3compare two populations using samples taken from them
CLO-4 Compare populations in its means and variances separately
CLO-5 identify situations to apply parametric and nonparametric tests
CLO-6interpret results of a hypothesis testing

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

TitleoftheCourse		Actuarial Statistics					
PaperNumber		Core VIII					
Category	Core	Year	II	Credits	4	Course Code	23K4S08
		Semester	IV				
InstructionalHours perweek		Lecture		Tutorial		LabPractice	Total
		3		1		–	4
Pre-requisite		Basic arithmetic					
Objectives of theCourse		Themain objectives ofthis courseare: 1. Itdevelopsagreaterunderstandingofstatisticalprinciplesandtheir applicationinacuarial statistics. 2. Describethecoreareasofactuarialpracticeandrelatetothoseareas actuarialprinciples,theoriesandmodels. 3. It givestheunderstandingoftheapplicationknowledgeofthelifeinsurance environment.					
CourseOutline		Unit ISimple and compound interest, present value and accumulated values of fixed rate, varying rate of interest					
		UnitMortality: Gompertz-Makehamlawsofmortality-lifetables. Annuities:Endowments,Annuities,Accumulations.Assurances.Family income benefits.					
		Unit III PolicyValues:Surrendervaluesandpaiduppolicies,industrialassurances,Jointlifeandlastsurvivorship,premiums.					
		Unit-IVContingentFunctions:Contingentprobabilities,assurances.Decrementtables.Pensionfunds:Capitalsumson retirementanddeath, widow's pensions,benefits dependentonmarriage.					
		Unit-VPrinciples of insurance, pure endowment, whole life assurance, Net premium for assurance and annuity plans-level annual premium under temporary assurance .					
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)		QuestionsrelatedtotheabovetopicsfromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/IAI IFoAtherstobesolved (TobediscussedduringtheTutorialhour)					

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N.M.Govt. Arts College for Women (Autonomous), Thanjavur

Skillsacquiredfromthis Course	Knowledge.ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Hooker.P.F., Longley, L.H.-Cook (1957) : Life and other contingencies, Cambridge. 2 AlistairNeill(1977):Lifecontingencies,Heinemannprofessional publishing. 3. Gupta and Kapoor (2001) Fundamentals of Applied Statistics
Reference Books	1. Study material of IAI/IFoA of Actuarial Societies 2. Hosack.I.B.,Pollard.J.H.andZehnwirth,B.(1999):introductorystatisticswithapplicationsingeneralinsurance,Cambridge University.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

CourseLearningOutcome(forMappingwithPOsandPSOs) Studentswill beableto

CLO1 :Toexplaintheutilitytheoryandinsuranceterminologies.

CLO2: Toarticulatetheinsuranceandannuitybenefitsthroughmultiplelifefunctions evaluationforspecialmortalitylaws.

CLO3 Todescribethevarioustypesofpremiumandtheirnumericalevaluations.

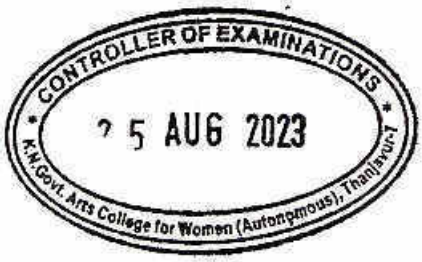
CLO4:Toexplainimplementationoftheinsurance policies.

CLO5: TodescribeInsurancepayableatthemomentofdeathandattheendoftheyear ofdeath-levelbenefitinsurance.

CLO6: To understand real life problems related to insurance

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak



CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

HOD OF STATISTICS
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5 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

Title of the Course		Practical – III (Calculator Based- Statistical Inference)					
Paper Number		Elective -V					
Category	Core	Year	II	Credits	2	Course Code	23K4SECS5P
		Semester	IV				
Instructional Hours Per week		Lecture	Tutorial	LabPractice	Total		
		1	1	--	2		
Pre-requisite		Estimation theory and distribution theory					
Objectives of the Course		Themain objectives ofthis courseare: 5. To make familiar with testing concepts 6. To understand the concept of Most Powerful test 7. To understand the Likelihood ratio tests and their uses 8. To apply tests for samples from unknown distributions					
Course Out line		**Unit I** Statistical Hypothesis – Null and Alternative Hypothesis – Simple and Composite hypothesis – Critical region – Type-I and Type-II error – Most Powerful test – Uniformly Most powerful test – Neyman Pearson Lemma – Simple problems.					
		Unit II Likelihood ratio test – Tests of mean of a normal population – Equality of two means of normal populations – test for variance of a normal population – Equality of variances of two normal populations.					
		Unit III Chi-square tests, Distribution of quadratic forms, Test of equality of several means, Analysis of Variance. Correlation and Regression testing.					
		Unit-IV Exact tests based on t distribution – One sample tests - one sided and two sided tests – Variance known and Variance unknown – Two sample tests – One sided and two sided - Variance known and Variance unknown.					
		Unit-V Nonparametric methods – Confidence interval for distribution					

	quantiles – Tolerance limits for distributions. Sign test, Wilcoxon test.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis Course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	3. Robert V. Hogg and Allen T.Craig (1978), Introduction to Mathematical Statistics, 4th edition, Macmillan Publishing Co., Inc. New York 4. An Introduction to Probability and Statistics (2001), Rohatgi.V.K, and A.K.Md.EhsanesSaleh, John Wiley & Sons
Reference Books	5. GuptaS.C. and Kapoor V.K. (1991) : Fundamentals of Mathematical Statistics, Sultan Chand & Sons. 6. Goon A.M. Gupta M.K. and Das Gupta B (1980) : An outline of Statistical Theory, Vol.II World Press Calcutta. 7. Mood A.M. Graybill F.A. and Boes D.C.B (1980) : Introduction to the Theory of Statistics 3/e, McGraw Hill, New York. 8. Gibbons, J.D. (1971) : Non-Parametric Statistical Inference, McGraw Hill.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject http://fisher.stats.uwo.ca/faculty/kulperger/SS3858/Handouts/np-lemma.pdf https://www.sciencedirect.com/topics/mathematics/uniformly-most-powerful-test https://www.probabilitycourse.com/chapter8/8_4_5_likelihood_ratio_tests.php https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/parametric-and-non-parametric-data/

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1frame hypotheses about population in real life research
CLO-2identify suitable testing procedure for given hypotheses
CLO-3compare two populations using samples taken from them
CLO-4 Compare populations in its means and variances separately
CLO-5 identify situations to apply parametric and nonparametric tests
CLO-6interpret results of a hypothesis testing

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

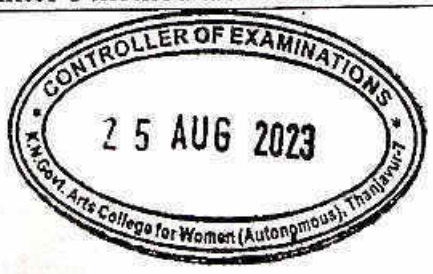
CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

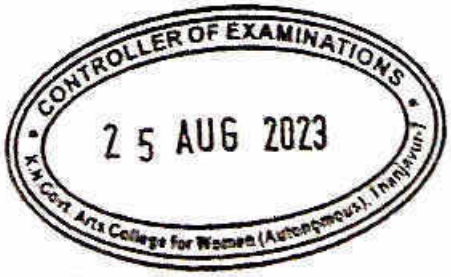
CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	**Economic & Official Statistics**						
Paper Number	**Elective – VI**						
Category	**Core**	**Year**	II	**Credits**	3	**Course Code**	**23K4SECS6:1**
		Semester	IV				
Instructional Hours Per week	**Lecture**	**Tutorial**		**LabPractice**		**Total**	
	3	1		--		4	
Pre-requisite	Not needed						
Objectives of the Course	Themain objectives ofthis courseare: 1. To understand Indian official statistical system and data collection 2. To know Indian economic and agricultural surveys 3. To know index numbers and consumer price index 4. To know time series analysis 5. To learn demand analysis and its concepts						
Course Out line	**Unit I** Indian Statistical System: Data Collection for Governance – NSSO and its role in national data collection. NSSO reports and publications						
	Unit II Economic Statistics: Information collection for Socio-Economic Survey – Agricultural, Industrial, Crime Statistics and Statistical methods applied to analyse large volumes of data						
	Unit III Index numbers: Basic problems in construction of index numbers. Methods- Simple and Weighted aggregate-Average of price relatives-Chain base method. Criteria of goodness-Unit test , Time Reversal Factor Reversal and Circular tests. Base Shifting, Splicing and deflating index numbers. Wholesale and Consumer price index numbers. Index of industrial production.						
	Unit-IV Time Series: Measurement of Trend : Graphic, Semi-averages, Moving averages. Least Squares – Straight line, Second degree parabola, Exponential curve, Modified Exponential curve, Gompertz curve and Logistic curve. Measurement of Seasonal variation by Ratio-to-Moving average method. Exponential smoothing , Holt Winter's method and Box-Jenkinson's method(only algorithm).						



	Unit-V Demand Analysis: Introduction-Demand and Supply. Price elasticity of demand and supply, partial and cross elasticities of demand. Types of data required for estimating elasticity. Methods of estimating demand functions: Leontief 's and Pigou's methods. Engel's law and Engel's curves. Pareto's law of law of income distribution. Utility function.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSCIES-ISS/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
SkillsacquiredfromthisCourse	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	5. Gupta S.C. and Kapoor V.K. (2007) :Fundamentals of Applied Statistics , 4th edition,Sultan Chand &Sons Publishers, NewDelhi. 6. GuptaS.P.(2011):StatisticalMethods,SultanChand&SonsPublishers,NewDelhi. 7. SpyrosMakridakis,StevenC.Wheelwrightand RobJ.Hyndman(2003):ForecastingMethodsandApplications,3rd Edition,JohnWileyandSons Inc. 8. Websites of Government of India – Ministry of Statistics &ProgrammeImplementation
Reference Books	3. SpyrosMakridakis, StevenC. WheelwrightandRobJ .Hyndman(2003):ForecastingMethodsand Applications,3rd Edition ,John Wileyand Sons Inc. . 4. IrvingW.Burr(1974):AppliedStatisticalMethods,AcademicPress.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject



Coursel earningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1:understand Indian official statistics and offices related to it

CLO-2understand Indian surveys for collecting official statistics

CLO-3know uses of index numbers

CLO-4 know demand analysis and its need

CLO-5 to understand economic India by knowing agricultural and economic surveys

CLO-6to know the time series and prediction

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	S	S	M
CLO6	S	S	M	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
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K.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	**Econometrics / Population Studies**						
Paper Number	**Elective – VI**						
Category	**Core**	**Year**	**III**	**Credits**	**3**	**Course Code**	**23K4SECS6:2**
		Semester	**VI**				
Instructional Hours per week	**Lecture**		**Tutorial**		**Lab Practice**		**Total**
	4		1		--		5
Objectives of the Course	1.To identify appropriate sources of data with basic vital statistics analyses 2. To relate the population with standardized death rates 3. To utilize the mortality table to find the survival and death rates 4. To analyze the birth rate used to describe fertility in the populations						
Course Outline	**Unit I** Introduction Objective behind building econometric models, nature of econometrics, model building, role of econometrics, structural and reduced forms. General linear model (GLM).Estimation under linear restrictions.						
	UNIT II Multicollinearity Introduction and concepts, detection of multicollinearity, consequences, tests and solutions of multicollinearity, specification error.						
	Unit III Vital Statistics Definition, Nature, Scope and Methods of vital statistics data - Measurement of Population – Development of Population Studies in India.						
	Unit IV Risk Measures Ratios, Proportions, and Rates – its properties, uses and simple problems; Morbidity Rates: Incidence proportions, Incidence rates, Prevalence rates – Definition, properties, uses and simple problems.						
	Unit V Fertility Rates Crude Birth Rate - General Fertility Rate - Age Specific Fertility Rate - Total Fertility Rate - Gross Reproduction Rate (GRR) - Net Reproduction Rate (NRR) - Replacement level Fertility - Birth order statistics - Child Women ratio - Order Specific Fertility Measures – Theory and Problems.						
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)						
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill						
Reference Books	1. Gujarati, D. and Sangeetha, S. (2007): Basic Econometrics, 4th Edition, McGraw Hill Companies. 2. Johnston, J. (1972): Econometric Methods, 2nd Edition, McGraw Hill International.						

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	3. Koutsoyiannis, A. (2004): Theory of Econometrics, 2nd Edition, Palgrave Macmillan Limited, 4. Maddala, G.S. and Lahiri, K. (2009): Introduction to Econometrics, 4th Edition, John Wiley & Sons. 5. Gupta S.P. & Kapoor V.K., Fundamentals of Applied Statistics, Sultan Chand & Sons, 2019. 6. Peter R Cox, Demography, 5th Edition, Vikas Publishing House,1979. 7. Agarwal S.N, India's Population Problems, Tata McGraw Hill, 1981. 8. Srinivasan, K, Basic Demographic Techniques and Applications, Sage Publications, New Delhi, 1998.
Webside	https://www.cdc.gov/esels/dsepd/ss1978/lesson3/section1.html

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.

CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.

CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statistics as a mathematical science

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
5 AUG 2023
Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
H.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Practical – V (Statistical Software Using R)					
Paper Number		SEC – VI (Discipline specific)					
Category	Core	Year / Semester	II / IV	Credits	2	Course Code	23K4SSEC6P
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		-	-	2	2		

Objectives:

The main objectives of this course are:

1. To enable the students to gain practical knowledge of test of significance in large and small samples.

2. To provide practical application of hypothesis testing based on single sample and two samples, using averages and proportions.
3. To provide practical application knowledge of the life insurance environment.
4. Understand the methods of computing assurance benefits and premiums of various insurance plans and to apply the various methods in framing mortality tables.

Programming Exercises :

1. Large Sample tests for means, proportions
2. Large Sample tests for standard deviations and correlation coefficient.
3. Small sample tests for single mean.
4. Small sample tests for difference of means and correlation coefficient.
5. Paired t –test.
6. Chi – square test for goodness of independence of attributes. 7. Non parametric test for single and related samples

a. Sign Test , b. Wilcoxon signed rank test

8. Non parametric test for two independent samples

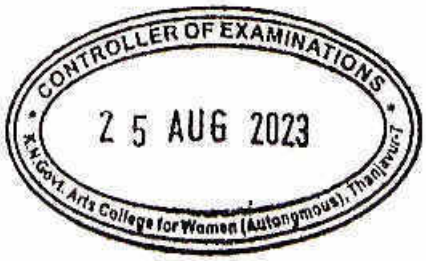
a. Median test, b. Wilcoxon Mann Whitney U – test

9. Creating an Actuarial table to input interest rate.

10. Creating functions Increasing and Decreasing life insurances.

11. Increaing and decreasing annuities both due and immediate.

12. Calculates the values of risk free rate.



Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks.

Any 3 questions are to be answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	75 Marks
CIA (Including Practical Record)	25 Marks
Total	100 Marks

CONTROLLER OF EXAMINATIONS
25 AUG 2023

HOD OF STATISTICS
G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Survey Sampling and Indian Official Statistics						
Paper Number	SEC VII						
Category	Core	Year	II	Credits	2	Course Code	23K4SSEC7
		Semester	IV				
Instructional Hours Per week	Lecture	Tutorial	Lab Practice	Total			
	2	-	--	2			
Pre-requisite	Probability theory						
Objectives of the Course	The main objectives of this course are: 1. To study the basic concepts of theory of Stochastic Processes, the most important types of Stochastic Processes, various properties and characteristics (Poisson, Morkov and others). 2. To learn the notions of ergodicity, stationarity and applications.						
Course Out line	UNIT I Concept of population and sample, complete enumeration versus sampling, sampling and non-sampling errors. Types of sampling: non-probability and probability sampling, basic principle of sample survey.						
	UNIT II Simple random sampling with and without replacement, definition and procedure of selecting a sample, estimates of: population mean, total and proportion, variances of these estimates, estimates of their variances and sample size determination. Comparison of systematic sampling with SRS and stratified sampling in the presence of linear trend and corrections.						
	UNIT III Introduction to Ratio and regression methods of estimation, first approximation to the population mean and total (for SRS of large size), variances of these estimates and estimates of these variances, Estimation of population mean and its variance, comparison (with and without randomly formed clusters). Relative efficiency of cluster sampling with SRS in terms of intra class correlation. Concept of sub sampling.						

CONTROLLER OF EXAMINATIONS

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	UNIT IV Present official statistical system in India, Methods of collection of official statistics, their reliability and limitations. Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO). **UNIT V** National Sample Survey Office (NSSO), and National Statistical Commission. Government of India's Principal publications containing data on thetopics such as population, industry and finance.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Cochran W.G. (1984):Sampling Techniques(3rd Ed.), Wiley Eastern. 2. Sukhatme,P.V., Sukhatme,B.V. Sukhatme,S. Asok,C.(1984). Sampling Theories of Survey With Application, IOWA State University Press and Indian Society ofAgricultural Statistics 3. Murthy M.N. (1977): Sampling Theory & Statistical Methods, Statistical Pub. Society, Calcutta.
Reference Books	1. Goon A.M., Gupta M.K. and Dasgupta B. (2001): Fundamentals of Statistics (Vol.2),World Press. 2. Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject http://ocw.jhsph.edu/courses/statmethodsforsamplesurveys/pdfs/lecture2.pdf https://www.questionpro.com/blog/stratified-random-

	https://www.scribbr.com/methodology/systematic-sampling/ http://home.iitk.ac.in/~shalab/sampling/chapter7-sampling-varying-probability-sampling.pdf http://mospi.nic.in/

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

CLO-1 Understand stochastic nature of random variable and different stochastic process

CLO-2know about transition matrix and its calculations

CLO-3understand Markov chain and its applications

CLO-4 understand Markov process and its applications

CLO-5 unserstandrenewel process and its applications

CLO-6know about various stochastic modeling and its applications

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	M	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	M	S	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

ES	ENVIRONMENTAL STUDIES	23KAEVS	Inst. Hrs 2	Credit 2

CO	STATEMENT
1	To learn the concept and Importance of Environment
2	To create awareness about the Biodiversity and its Conservation
3	To understand the various pollution, its causes and its prevention
4	To understand the environmental Laws
5	To understand the Environmental Agencies

Unit I: Environment- Definition- Concept, Components and Importance. Ecosystem- Structure and function- Food chain, food web and Ecological pyramids.

Unit II: Biodiversity- Definition- Importance- flora and fauna of India- Endangered and threatened species in India- Conservation strategies (Insitu and Exsitu)

Unit III: Environmental pollution- Definition- Agents/ causes effects and control measures of air, water, land and Noise pollution- Nuclear hazards.

Unit IV: Environmental Laws and Ethics- Wild life Act– Water act– Air act– and Environmental protection Act– Environmental Ethics (Libertarian Extension- Ecological Extension- Conservation Ethics)

Unit V: Environmental Agencies- National (Department of Environment, forest and wildlife) International (UNICED- Earth Summit- Only one Earth)- Man and Biosphere (MAB).

Text Book:

(1) K. Kumaraswamy, A. Alagappa Moses, M. Vasanthy, "Environmental Studies", Bharathidasan University, Trichy- 620 024.

(2) P. Chandrasekaren, "Sutrusuzhal payilvugal", U.G.C Core Module Course in Environmental Studies, T K Publication, Pudukkottai.

(3) V. Kumaresan, "Plan Ecology and Phytogeography".

(4) D. Dharmaraj, "Environmental Science".

(5) N.Arumugam, "Environmental Studies".

(6) B. Chandrasekaran, "Environmental Studies".

Reference:

(1) P. D. Sharma, "Ecology and Environment".

(2) Purohit, "A Text Book of Environmental Sciences".

(3) M. P. Mishara, "Our Environmental Pollution Control and Future Strategies".

Title of the Course		**Quantitative Aptitude**					
Paper Number		**ECC – III**					
Category	Core	**Year**	II	**Credits**	3	**Course Code**	23K4SECC3:1
		Semester	IV				
Instructional Hours Per week		**Lecture**	**Tutorial**	**LabPractice**	**Total**		
		-	-	--	-		
Pre-requisite		Not needed					
Objectives of the Course		Themain objectives ofthis courseare: 1. To understand Indian official statistical system and data collection 2. To know Indian economic and agricultural surveys 3. To know index numbers and consumer price index 4. To know time series analysis 5. To learn demand analysis and its concepts					
Course Out line		**Unit I** Numbers- operations on numbers, H.C.F and L.C.M. of numbers, decimal fractions, simplification, square roots and cube roots, problems on numbers.					
		Unit II Average, problems on ages, surds and Indices, percentage.					
		Unit III Profit and Loss , Partnership , Chain Rule , Time and Work ,Ratio and Proportion.					
		Unit IV Time and Distance , Problems on Trains Pipes and Cistern , Allegation or Mixture, Area ,Volume and Surface Area.					
		Unit V Simple Interest, Compound Interest, Stocks and Shares, True Discount and Bankers Discount.					
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)		Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSCIES-ISS/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)					
Skillsacquiredfromthis Course		Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill					

Recommended Text	1. Quantitative Aptitude – Dr.R.S.Aggarwal
Reference Books	1. Quantitative Aptitude – Dr.R.S.Aggarwal
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (forMappingwithPOsandPSOs) Students will be able to

CLO-1:understand Indian official statistics and offices related to it
CLO-2understand Indian surveys for collecting official statistics
CLO-3know uses of index numbers
CLO-4 know demand analysis and its need
CLO-5 to understand economic India by knowing agricultural and economic surveys
CLO-6to know the time series and prediction

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	S	S	M
CLO6	S	S	M	S	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

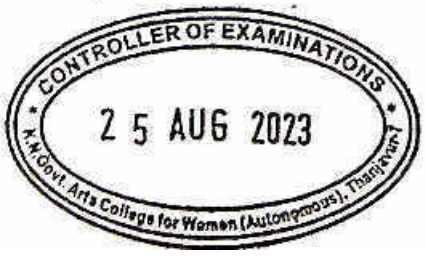
CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.N. Govt. Arts College for Women (Autonomous), Thanjavur-1

HOD OF STATISTICS
H.N.G.A.C. (W) (AUTO)
THANJAVUR

TitleoftheCourse		Stochastic Process					
PaperNumber		Core IX					
Category	Core	Year	III	Credits	5	Course Code	23K5S09
		Semester	V				

InstructionalHours perweek	Lecture	Tutorial	LabPractice	Total
	4	2	–	6

Pre-requisite	Probability theory
Objectives of theCourse	Themain objectives ofthis courseare: 1. To study the basic concepts of theory of Stochastic Processes, the most important types of Stochastic Processes, various properties and characteristics (Poisson, Morkov and others). 2. To learn the notions of ergodicity, stationarity and applications.
CourseOutline	**Unit I** Notion and specification of Stochastic Processes – Stationary Process – Markov Chains – Definition and examples – Higher transition probabilities: Chapman – Kolmogorov equations. Classification of States and Chains
	Unit II Markov Chains – Determination of Stability of a Markov System – Limiting Behaviour – Ergodic theorem. One dimensional random walk
	Unit III Markov Processes with discrete state space: Poisson Process – Postulates of Poisson process Properties of Poisson Process – Poisson process and related distributions. Pure Birth process – Yule-Furry process.Pure Death Process – Simple Birth and Death Process.
	Unit-IV Renewal Process – Definition, related concepts and examples – Renewal equation – Elementary Renewal Theorem – Basic Renewal Theorem.
	Unit-V Applications in Stochastic Models: Queuing Systems and Models: Simple queuing models M/M/1, M/M/s queuing systems (finite and



	infinite) steady state solution-simple problems with finite and infinite capacities.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Medhi, J. (2019): Stochastic Processes, New Age International Publishers. 2. KantiSwarup, Gupra.P.K. Man Mohan.,(2010): Operations Research, Sultan Chand & Sons
Reference Books	1. Karlin ,S. and Taylor, H.M.(1975): A first Course in Stochastic Processes, Academic Press, New York. 2. Ross, S.M. (1983): Stochastic Processes. John Wiley Eastern Ltd., New York.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject http://www.randomservices.org/random/ https://www.britannica.com/science/stochastic-process

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1 Understand stochastic nature of random variable and different stochastic process

CLO-2know about transition matrix and its calculations

CLO-3understand Markov chain and its applications

CLO-4 understand Markov process and its applications

CLO-5 unserstandrenewel process and its applications

CLO-6know about various stochastic modeling and its applications

CONTROLLER OF EXAMINATIONS
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	M	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	M	S	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

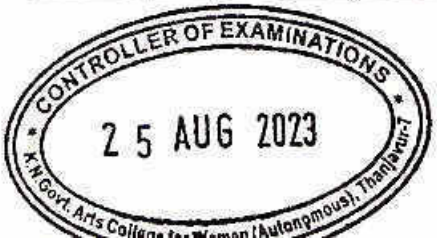
Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
H.N.G.A.C. (W) (AUTO)
THANJAVUR

TitleoftheCourse	Regression Analysis						
PaperNumber	Core X						
Category: Core	Year	III	Credits	5	Course Code	23K5S10	
	Semester	V					
InstructionalHours perweek	Lecture	Tutorial	LabPractice	Total			
	4	2	--	6			
Pre-requisite	Linear regression analysis, Estimation theory						
Objectives of theCourse	Themain objectives ofthis courseare: 1. To understand linear and nonlinear relationships betweenvariables and training the students in applications oriented. 2. To teach Linear Regression models, its assumptions and itsproperties. 3. To perform model adequacy check before using Linear Regressionmodels						
CourseOutline	**Unit I** Simple linear regression-Assumptions, estimation of model parameters, standard error of estimators, testing of hypotheses on slope and intercept (β's), interval estimation of model parameters, prediction interval of a new observation, coefficient of determination, regression through origin.						
	Unit II Standard Gauss Markov setup, least square estimation of model parameters, variance covariance of least squares estimators, estimation of error variance Tests of hypotheses – significance of regression (ANOVA, $R^2$and adjusted R^2), individual regression coefficients, subset of regressor variables, general linear hypotheses- Confidence intervals and regions, prediction intervals, detecting hidden interpolation.						
	Unit III Model adequacy checking - residual plots for checking normality homoscedasticity and detection of outliers. Test for Lack of fit of the model. Durbin – Watson test for autocorrelation. Analytical methods for selecting a transformation generalized and weighted least						

	squares- Detection of influential observations – Cooks statistic, DFFITS, DFBETAS. Variance stabilizing transforms and transforms to linearize the model, analytical methods for selecting a transform, generalized and weighted least squares.Dummy (or indicator variables) – general concepts and their use
	Unit-IV Multicollinearity – sources, effects, diagnostics, Methods of dealing with multi collinearity (collection of additional data, model respecification, Ridge regression). Selection of Variables – forward selection, backward elimination and stepwise regression (algorithms only)
	Unit-V Nonlinear regression – transformation to a linear model, their use and limitations, initial estimates (starting values), parameter estimation using iterative procedures – Gauss-Newton, steepest Descent, Marquardt's compromise. Count data- Poisson Regression – variables selection- Non – parametric regression.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	1. Montgomery, D. C., Peck, E. A. and Vining, G. G. (2003): Introductionto Linear regression analysis, third edition, John Wiley and Sons,Inc. 2. Zar, J.H. (2006): Biostatistical Analysis, fourth edition, Pearsoneducation. 3. Douglas C. Montgometry (2012)Introduction to Linear Regression Analysis. 4. Iain Pardoe (2012): Applied regression Modeling, second edition,Wiley



Reference Books	1. Draper, N.R. and Smith, H. (2003): Applied Regression Analysis,third edition, John Wiley and Sons,Inc. 2. Johnston, J. (1984): Econometric methods, third edition, McGrawHill International. 3. A. Sen, M. Srivastava, Regression Analysis — Theory, Methods, and Applications, Springer-Verlag, Berlin,2011.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject http://home.iitk.ac.in/~shalab/regression/Chapter2-Regression-SimpleLinearRegressionAnalysis.pdf http://www.mit.edu/~6.s085/notes/lecture3.pdf https://ncss-wpengine.netdna-ssl.com/wp-content/themes/ncss/pdf/Procedures/NCSS/Nonlinear_Regression.pdf https://data.princeton.edu/wws509/notes/c4.pdf http://home.iitk.ac.in/~shalab/regression/Chapter15-Regression-PoissonRegressionModels.pdf

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1 Estimating model parameters and testing it

CLO-2understand linear and nonlinear models assumptions

CLO-3check model adequacy

CLO-4 know about variable selection

CLO-5 know about nonlinear regression models

CLO-6choose model if some of the basic assumptions are violated also

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	M	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	M	S	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H.Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
H.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Practical – VI (Core – IX & X)**					
Paper Number		**Core XI (P)**					
Category	**Core**	**Year**	**III**	**Credits**	**5**	**Course Code**	**23K5S11P**
		Semester	**V**				
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**		
		4	2	--	6		
Objectives of the Course		The main objectives of this course are: 1. To enable the students to gain practical knowledge stochastic process problems. 2. Demonstrate the fitting of linear regression models for real time data. 3. Infer model adequacy through various model selection process.					
Course Outline		**UNIT I** Transition probability Matrix – Stationarity of Markov Chain and graphical representation of Markov Chain.					
		Unit II Poisson Process – probabilities of birth and death Process – Yule – Furry Process.					
		Unit III Queuing Systems – Single server exponential queuing system – Single server exponential queuing system having finite capacity.					
		Unit-IV Simple linear regression – Confidence interval estimation of simple linear regression					
		Unit –V Normality of residuals – Multicollinearity in simple and multiple linear regression – Heteroscedasticity and auto correlation in simple and multiple regression.					

Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks.
Any 3 questions are to be answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	75 Marks
CIA (Including Practical Record)	25 Marks
Total	100 Marks

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HOD OF STATISTICS
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THANJAVUR

TitleoftheCourse		PROJECT					
PaperNumber		CC– XII					
Category	Core	Year	III	Credits	4	Course Code	23K5S12PW
		Semester	V				
InstructionalHours perweek		Lecture	Tutorial		LabPractice	Total	
		-	-		-	6	
Pre-requisite							

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HOD OF STATISTICS
H.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Statistical Quality Control						
Paper Number	Elective- VII						
Category: Core	Year	III	Credits	3	Course Code	23K5SECS7:1	
	Semester	V					
Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total			
	3	1	--	4			
Pre-requisite	Estimation theory and Distribution theory						
Objectives of the Course	The main objectives of this course are: 1. To impart basic theoretical knowledge about terminologies, need of control charts for quality control, construct control limits of variables and attributes. 2. To educate the learner to be able to construct control charts for defects, number of defects (c-chart); and control chart for number of defects per unit (u-chart). 3. To educate acceptance sampling plan and discuss the procedure of its implementation, compute the probability of accepting or rejecting a lot. 4. To define acceptance quality level (AQL) and lot tolerance percent defective(LTPD) of the lot; and compute the producer's risk and consumer's risk for an acceptance sampling plan. 5. To facilitate the learner to understand the difference between attributes and variables sampling plans, the advantages and disadvantages of variables sampling.						
Course Outline	**Unit I** Importance and need for Statistical Quality Control techniques in Industry – Causes of variations in Quality – Uses of Shewart's Control charts –Terminologies: Specification limits, Tolerance limits, 3σ limits and Warning limits – Theory of runs and its applications in Quality control. Basis of sub grouping – Advantages and Limitations of SQC Control charts variables:Control Chart for Mean (Xbar- Chart) ,Range Chart (R-Chart) , Standard Deviation Chart (S-Chart) - Process Capability Analysis						
	Unit II Control Charts for Attributes: Control Chart for Fraction Defective (p-Chart) ,p-Chart for Variable Sample Size , Control Chart for Number of Defectives (np-Chart). Control Charts for Defects: Control Chart for Number Of Defects (C-Chart)and Control Chart for Number Of Defects Per Unit (U-Chart).						

	Unit III Acceptance sampling plans for attributes –Types of Acceptance Sampling plans, Methods of Inspection: 100% Inspection and Sampling Inspection , Advantages and
	Limitations of Acceptance Sampling. Terms used in acceptance sampling plans: Lot, Lot Size, Sample Size, Lot Quality, Acceptance Number , Probability of accepting a lot (Pa) , Acceptance Quality Level (AQL), Lot Tolerance Percent Defective (LTPD), Producer's Risk, Consumer's Risk, AOQ, AOQL, ATI and ASN.
	Unit-IV Rectifying Sampling Plans. Single and Double sampling plans. OC, AOQ, ATI and ASN curves for Single and Double sampling plans.
	Unit-V Acceptance sampling for variables known and unknown sampling plans (one sided specification only) -Determination of n and k for one sided specification of OC curve
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Douglas C. Montgomery (2005) : Introduction to Statistical Quality Control, John Wiley & Sons, New York. (Unit V: Chapter 16 (pages 670 to 680) 2. Gupta S.C and V.K.Kapoor (2007): Fundamentals of Applied Statistics, Sultan Chand Sons, New Delhi 3. Mahajan, M (1998) : Statistical Quality Control, DhanpatRao& Co, New Delhi.
Reference Books	1. Gupta, R.C.(1974): Statistical Quality Control. 2.Ekambaram, S K. (1963): Statistical basis of Acceptance sampling, Asia Publishing House. 3. Grant, E,L. and Laven Worth, R.S.: Statistical Quality Control, McGraw Hill.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

CLO-1 understand Industrial applications of Statistics

CLO-2 understand statistical process control and methods for it

CLO-3 understand attribute and variable control chart and interpret process based on it

CLO-4 understand the situations using special purpose control charts

CLO-5 know various product control techniques

CLO-6 To do numerical problems and able to get critical thinking to solve problems
To explore real life problems

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	S	S	S	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	S	S
CLO4	S	S	S	S	S	S	S	S	M
CLO5	S	S	M	M	M	S	M	M	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

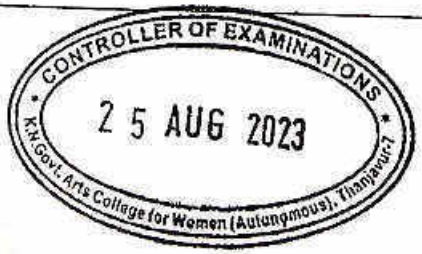
CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
H.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Simulation And Inventory**					
Paper Number		**EC VII**					
Category	Core	**Year**	III	**Credits**	3	**Course Code**	**23K5SECS7:2**
		Semester	V				

Instructional Hours Per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	3	1	--	4

Objectives of the Course	1. Explain the meaning and objective, describe the meaning and objective of inventory management 2. Know the factor affecting the level of inventory 3. Also understand the various techniques of inventory control.
Course Out line	**Unit I** Simulation -Introduction, Reasons for applying simulation technique, Methodology of simulation, simulation models, Advantages and Limitations of simulation. Event – type simulation – Simple problems. Generation of random numbers – various methods of generation of random numbers. Monte – Carlo simulation and its general procedure – simple problems. **Unit II** Introduction of Inventory – Objectives of Scientific Inventory control – Reasons for maintaining Inventories – Types of Inventories – Cost associated with Inventories – Factors affecting Inventory control. The concept of EOQ. Deterministic Inventory Model (EOQ Model) :Model : I – Derivation of EOQ model with uniform rate of demand, Infinite production rate, no shortage & lead time is zero – simple problems. **Unit III** Deterministic inventory problems with no Shortages :Model : II – Derivation of EOQ model with several production runs of unequal length, no shortage and lead time is zero – simple problems.



	Model : III – Derivation of EOQ model with uniform rate of demand, finite production rate, no shortage and lead time is zero – simple problems. **Unit IV** Deterministic Inventory problem with Shortages Model : IV – Derivation of EOQ model with infinite production and variable order cycle time, shortage allowed and lead time is zero – simple problems. Model :V – Derivation of EOQ model with finite production, shortage allowed and lead time is zero – simple problems. **Unit V** Inventory problems with uncertain demand – Determining optimum buffer stock . Systems of Inventory control – Fixed order quantity system (Q-System), Periodic Review System (P- System) – simple problems. Comparison between Q-System and P- System.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skillsacquiredfromthis course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Kanthi Swarup, Gupta, P.K. & Man Mohan : Operations Research – Suttan Chand & Sons – New Delhi.
Reference Books	1. Kanthi Swarup, Gupta, P.K. & Man Mohan : Operations Research – Suttan Chand & Sons – New Delhi.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.

CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.

CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function

CLO-6 Obtain the mathematical knowledge and skills for the better understanding of statistics as a mathematical science

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H. Govt. Arts College for Women (Autonomous), Thanjavur-1

HOD OF STATISTICS
H.H.G.A.C.(W)(AUTO),
THANJAVUR

Title of the Course		Summer Internship – Industrial visit/ Field Visit					
Paper Number		CC– XII					
Category	Core	Year	III	Credits	2	Course Code	23K5I
		Semester	V				
Instructional Hours Per week		Lecture	Tutorial		LabPractice	Total	
		-	-		-	-	
Pre-requisite							

CONTROLLER OF EXAMINATIONS
25 AUG 2023
H.H.Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
H.H.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Design of Experiments						
Paper Number	Core XIII					Course Code	23K6S13
Category: Core	Year	III	Credits	6			
	Semester	VI					
Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total			
	5	2	--	7			
Pre-requisite	Linear models						
Objectives of the Course	The main objectives of this course are: 1. To get theoretical knowledge in Statistical Design of Experiments and analysis of variance 2. To build strong theoretical foundation in Orthogonal latin squares, Hyper Graeco Latin squares, factrorial and fractional factorial experiments, PIBD, inter and intra blocks, split plot, analysis covariance, Response surface methodology 3. To develop analytical thinking in problem solving skills						
Course Outline	**Unit I** Fundamental Principles of Experiments – Replication, Randomization and Local Control techniques – Size of experimental unit – Methods of determination of experimental units – (Maximum curvature method – Fairfield Smith's variance law).						
	Unit II Analysis of variance – One way, Two way, classification (without interaction) – Multiple range test; Newman-Keul's test – Duncan's multiple range test – Tukey's test – Transformation – Square root, angular and log transformations.						
	Unit III Completely Randomized Design (CRD) and its analysis – Randomized block design (RBD) abd uts abaktysus – RBD – More than one but equal number of observations per cell – Latin Square Design (LSD) and its analysis.						
	Unit-IV Missing plot techniques – Meaning – Least Square method of estimating one missing observation – RBD and LSD – Two observations missing in RBD and LSD – Analysis of covariance technique in CRD and RBD (without derivation).						
	Unit-V Factorial experiment – Definition – 2^2, 2^3 and 3^2 factorial experiments and their analysis – Principles of confounding – Partial and complete confounding in 2^3 – Split plot design and its analysis.						

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Das, M.N. and Giri N.C (1979) : Design and Analysis of Experiments, Wiley Eastern, New Delhi. 2. Gupta S.C. and Kapoor V.K (2007) : Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.
Reference Books	1. Kempthorne, (1956): Design and Analysis of Experiments, John Wiley, New York. 2. Montgomery . D. (1985): Design of Experiments, John Wiley and Sons.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 To understand analysis of variance and experimental designs

CLO-2 To have strong theoretical knowledge in Orthogonal latin squares, Hyper Graeco Latin squares

CLO-3 Know factorial and fractional factorial experiments, PIBD, inter and intra blocks, split plot, analysis covariance

CLO-4 To understand clinical trial concepts and Response surface methodology

CLO-5 To do numerical problems and able to get critical thinking to solve problems

CLO-6 To choose suitable experiment and do it for real life problems

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	S	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	M	S	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

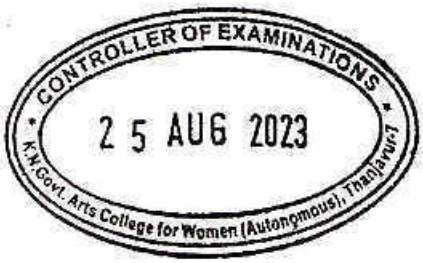
CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
A.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Demography					
Paper Number		Core – XIV					
Category	Core	Year	III	Credits	6	Course Code	23K6S14
		Semester	VI				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	2	--	7		
Pre-requisite							
Objectives of the Course		The main objectives of this course are: 1. Learn population and demographic registration 2. To learn fertility and mortality measurements 3. To understand Life table uses 4. To learn migration effect					
Course Out line		**Unit I** Sources of demographic data – civil registration – population census registers – errors in demographic data – methods of improvements.					
		Unit II Fertility and mortality measurements – general and specific rates – standardized rates – age pyramid of sex composition gross and net reproduction rates.					
		Unit III Life table – structure – construction – relationship between the function of a life table – abridged life table – population estimation – growth rates – gross and net reproduction rates component method of population projection – forces of mortality – Gompertz and Makeham's law – logistic curve fitting and its use.					
		Unit-IV Spatial distribution of population –migration – kinds of migration – factors important in migration analysis – migration defining period and boundary – migration data by vital statistics and survival ratio and National Growth rate methods					
		Unit-V Components of population growth and change – Demographic transition theory – Methods of population projection – component method of projection, Leslie matrix, Logistic curve and its graduation					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					



Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Berclay, G.W.(1959) : Techniques of Population Analysis 2. Benjamin, B (1968) : Health and Vital Statistics, Allen & Unwin
	Srivastava, 3. O.S.(1983) : A text book of Demography , Vikas Publishing. 4. Bogue , Donald J: Principles of Demography (1976) John Willey, New York
Reference Books	1. Pathak. K.B. and Ram. F (1992): Techniques of Demography, Wiley Eastern. 2. Ram Kumar R (1986): Technical Demography, Wiley Eastern
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 to understand need of population study and its registration system

CLO-2 to understand fertility and mortality effect on population

CLO-3 to understand life table and its usage to real problems

CLO-4 to get effect of migration in population

CLO-5 to understand population growth and its effect

CLO-6: to understand the need of population study for a government

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	S	S	S	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	S	S
CLO4	S	S	S	S	S	S	S	S	M
CLO5	S	S	M	M	M	S	M	M	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

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CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-1

HOD OF STATISTICS
K.N.G.A.C.(W)(AUTO)
THANJAVUR

Title of the Course	Practical – VII (SPSS Core XIII & XIV)					
Paper Number	Core XV (P)				Course Code	23USTCP05
Category: Core	Year	III	Credits	6		
	Semester	VI				
Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total		
	5	2	--	7		

Objectives:

The main objectives of this course are:

1. Apply the theoretical concepts and solve the problems based on one missing observation and two missing observations in RBD and LSD.
2. Analyse and interpret data for 2^2, 2^3 and factorial experiments by using Yates Algorithm.
3. Apply the methods of estimating net migration rates.
4. Execute the various fertility measures sources of demographic data.

Programming Exercises :

1. One Way ANOVA – Loading and preparing data , Interpreting the results & Visualizing one way ANOVA.
2. Two Way ANOVA – Preparing data, performing two way ANOVA ,Visualizing two way ANOVA with results.
3. Repeated Measures ANOVA– Understanding repeated measures designs, preparing and analyzing data and result.
4. Missing plot techniques – Estimating One missing observation, Two missing observations in LSD.
5. Estimating One missing observation, Two missing observations in RBD.
6. Factorial Experiments - Analysis of 2^2 factorial experiments using Yates algorithm.
7. Analysis of 2^3 factorial experiments using Yates algorithm.
8. Analysis of 3^2 factorial experiments.
9. Measures of Population size, growth and composition.
10. Age – sex distribution analysis
11. Fertility and mortality analysis
12. Demographic Modeling Using Life tables, Modeling fertility and mortality rates.

Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks.

Any 3 questions are to be answered in 3 hours duration.

Examinations Distribution of Marks	
University Examinations (Written Practical)	75 Marks
CIA (Including Practical Record)	25 Marks
Total	100 Marks

CONTROLLER OF EXAMINATIONS
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K.N.Govt. Arts College for Women (Autonomous), Thanjavur

STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	**Operations Research**						
Paper Number	**Elective – VIII**						
Category	**Core**	**Year**	**III**	**Credits**	3	**Course Code**	23K5SECS8:1
		Semester	VI				
Instructional Hours Per week	**Lecture**		**Tutorial**		**Lab Practice**	**Total**	
	5		2		--	7	
Pre-requisite	Linear algebra						
Objectives of the Course	The main objectives of this course are: 1. Optimization techniques 2. Transportation problems 3. Game theory 4. Replacement problems 5. Network analysis						
Course Out line	**Unit I** Formulation of Linear programming models – Graphical solution of LPP in two variables – LPP in standard form – Principles of Simplex method – Algorithm – Need for artificial variables – Charne's M-Technique – Concept of degeneracy.						
	Unit II Transportation problem(TP) – TP formulation- North-West Corner, Least cost, Vogel's Approximation method – UV-method – Assignment problem and algorithm.						
	Unit III Theory of Games – Basic definition – Maximin and Minimax criterion – Solution of Games with saddle points – Two–by–Two (2x2) Games without saddle point – principle of dominance – problems based on dominance rule – Graphical method for (2xn) and (mx2) games.						
	Unit-IV Replacement problems – Replacement policy for items whose maintenance cost increases with time and the value of money remains constant – Replacement policy for items whose maintenance cost increases with time and the value of money also changes with time – Replacement of items that fail completely – Group replacement policy						
	Unit-V Network analysis by CPM/PERT : Basic Concept – Constraints in Network – Construction of the Network – Time calculations – Concept of slack and float in Network Analysis –						

	Network crashing – Finding optimum project duration and minimum project cost.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	5. Kanti Swarup, P.K. Gupta and Manmohan (2007) Operations Research, Sultan Chand Sons, New Delhi. 6. S.D. Sharma (2002) : Operations Research: Kedarnath and Ramnath, Meerut. 7. J.K. Sharma (2002) : Operations Research: Theory and application , Macmillan, India Ltd.
Reference Books	1. Taha : Operations Research, PHI. 2. F.S. Hiller and Liberman (1994): Operations Research, CBS Publishers and Distributions, New Delhi.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Out come(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1understand optimization techniques and solving set of equations with constraints

CLO-2solve problems of linear programming

CLO-3understand transportation problems and its applications

CLO-4 solve problems using games theory

CLO-5 do replacement problems and solve it

CLO-6do network analysis and get problem solving skills

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	M	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	M	S	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Bayesian Inference						
Paper Number	Elective VIII						
Category: Core	Year: III	Semester: VI	Credits: 3	Course: Core	23K6SECS8:2		
Instructional Hours Per week	Lecture: 5	Tutorial: 2	Lab Practice: --	Total: 7			
Pre-requisite	Estimation theory and Distribution theory						
Objectives of the Course	To develop the Bayesian frame work for data analysis and its flexibility and be able to demonstrate.						

Course Out line

Unit-I: BAYESIAN POINT ESTIMATION

Bayesian point estimation: as a prediction problem from posterior distribution. Bayes estimators for (i) absolute error loss (ii) squared error loss (iii) 0-1 loss.

Unit-II: GENERALIZTION OF FUNCTIONS

Generalization to convex loss functions. Evaluation of the estimate in terms of the posterior risk. theorem – prior and posterior distributions. Conjugate priors and Jeffrey's priors, examples.

Unit-III: BAYESIAN INTERVAL ESTIMATION

Bayesian interval estimation: Credible intervals. Highest posterior density regions. Interpretation of the confidence coefficient of an interval and its comparison with the interpretation of the confidence coefficient for a classical confidence interval.

Unit-IV :BAYESIAN TESTING OF HYPOTHESIS

Bayesian testing of hypotheses : Specification of the appropriate form of the prior distribution for a Bayesian testing of hypothesis problem. Prior odd's Posterior odds.

	Unit-V: BAYESIAN FACTORS OF TYPES OF HYPOTHESIS PROBLEMS Bayes factor for various types of testing hypothesis problems depending upon whether the null hypothesis and the alternative hypothesis are simple or composite.
ExtendedProfessionalComponent (is a part ofinternal component only,Not to be included in theExternalExamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skillsacquiredfromthis course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrableSkill
Recommended Text	Berger,J.O. : Statistical decision theory and Bayesian analysis, Springler Verlag. Robert, C.P. and Casella, G.Monte Carlo : Statistical methods, Springer Verlag. Leonard, T. and Hsu, J.S.J. : Bayesian methods, Cambridge University press.
Reference Books	Degroot, M.H. : Optimal statistical decisions, McGraw Hill. Bernando, J.M. and Smith, A.F.M. :Baysian theory, John Wiley and sons. Robert, C.P. : The Bayesian choice : A decision theoretic motivation, Springer.

Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1understand Industrial applications of Statistics
CLO-2 understand statistical process control and methods for it
CLO-3 understand attribute and variable control chart and interpret process based on it
CLO-4 understand the situations using special purpose controlcharts
CLO-5 know various product control techniques
CLO-6 Todonumericalproblemsandabletoget criticalthinkingtosolveproblems
Toexplorereallifeproblems

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	S	S	S	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	S	S	M	S	S	S
CLO4	S	S	S	S	S	S	S	S	M
CLO5	S	S	M	M	M	S	M	M	M
CLO6	S	S	M	S	M	S	S	M	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

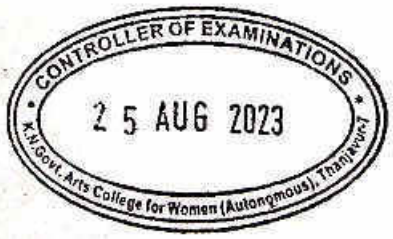
CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Introduction to R language/ Python						
Paper Number	SEC – 8						
Category: Core	Year	III	Credits	2	Course Code	23K6SSEC8	
	Semester	VI					
Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total			
	2	-	--	2			
Pre-requisite	Knowledge of R/Python						
Objectives of the Course	Upon completing this course, students will be able to: 1. Develop a regular workflow to execute reproducible research and analysis using R and R Studio and communicate the results and implications to others. 2. Install and use R packages for specific application. 3. Import data from a variety of external sources 4. Write basic R functions using control and data structures 5. To know the basic concepts of Python.						
Course Outline	**Unit – I** Installation of R - Features of R -Variables in R-Constants in R-Operators in R.Creating data frame-Operations on data frames Accessing data frames-Creating data frames from various sources. Creating lists-Manipulating list elements-Merging lists						
	Unit – II Datatypes and R Objects-Accepting Input from keyboard-Important Built-in functions. Creating Vectors-Accessing elements of a VectorOperations on Vectors-Vector Arithmetic-Converting lists to vectors. Creating arrays-Accessing array elements-Calculations across array elements.						
	Unit – III Creating matrices-Accessing elements of a Matrix-Operations on Matrices-Matrix transpose.R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets- if...else statement-if else() function-switch() function-repeat loop-while loop-for loop-break statement-next statement						
	Unit – IV Introduction to python – Data types, Variables, Basic Input – Output Operations , Basic Operators.						
	Unit – V Functions, Tuples, Dictionaries and data Processing.						
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication.and Transferrable Skill						



References Books	1. Hadley Wickham : "R Packages " Latest Edition – Shroff /O'Reilly Publisher. 2. Charles Severance : "Python for Everybody : Exploring Data in Python 3 .

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Students will able to install, code and use basic R programming & Python

CLO-2 Describe key terminologies, concepts and techniques employed in statistical analysis

CLO-3 Understand how to write simple coding

CLO-4 Compile and run the program

CLO-5 Interpret the result

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
AUG 2023
K.N. Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Allied courses

Title of the Course		Allied - Statistics For Mathematics -I					
Paper Number		EC -IV					
Category	Core	Year / Semester	II / III	Credits	4	Course Code	23K3MECS4:1

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	4	-	--	4

Pre-requisite	Basis of Statistics
Objectives of the Course	1. To introduce the basic concepts of probability theory, random variables, probability distribution. 2. To introduce t the statistical concepts and develop analytical skills.
Course Outline	**Unit I Probability, Random Variable and Mathematical Expectation** Definitions – Addition and Multiplication Theorem of Probability – Conditional probability – Random variable (discrete and continuous) – Distribution functions – Marginal and Conditional Distributions – Mathematical Expectation – Moment generating function - Characteristic function (concept only) – Tchebychev's inequality - Simple Problems.
	UNIT II Discrete and Continuous Distributions Binomial and Poisson Distributions – Derivations – Properties and Applications - Simple Problems – Normal distribution – Derivations – Properties and Applications - Simple Problems.
	Unit III Measures of Central Tendency, Measures of Dispersion and Skewness Definitions – Mean , Median , Mode , Geometric mean , Harmonic mean – Merits and demerits – Range , Quartile deviation , Mean deviation and their coefficients - Standard deviation – Co-efficient of Variation - Merits and demerits – Measure of Skewness – Karl Pearson's and Bowley's Coefficient of Skewness.
	Unit IV Curve Fitting Method of least square – Fitting of a straight line and second degree Parabola, Fitting of Power Curve and Exponential Curves – Simple Problems.
	Unit V Correlation and Regression Definition – Types and methods of measuring correlation – Scatter diagram , Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient - Regression lines - Regression coefficients – Properties – Regression equations .
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Reference Books	1. Gupta S. C and Kapoor V. K (2004), Fundamentals of Mathematical Statistics, (11th edition), Sultan Chand & Sons, New Delhi. 2. Gupta S. P. (2001), Statistical Methods, Sultan Chand & Sons, New Delhi. 3. Sancheti D. C and Kapoor V. K (2005), Statistics (7th Edition), Sultan Chand & Sons, New Delhi. 4. Robert V. Hogg, Allen T. Craig, Joseph W. McKean , Introduction to mathematical statistics, Pearson Education. 5. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 6. Marek Fisz, Probability theory and Mathematical Statistics, John Wiley and Sons. 7. Rohatgi V. K, An Introduction to Probability theory and Mathematical Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 8. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 9. Vittal P. R, Mathematical Statistics, Margham Publications, Chennai. 10. Hoel P. G, Introduction to Mathematical Statistics, Asia Publishing House, New Delhi.
Weblinks	https://seeing-theory.brown.edu/probability-distributions/index.html https://www.kullabs.com/classes/subjects/units/lessons/notes/notedetail/9557 https://www.stat.berkeley.edu/~stark/SticiGui/Text/location.html https://www.originlab.com/index.aspx?go=Products/Origin/DataAnalysis/CurveFitting https://www.bmj.com/about-bmj/resources-readers/publications/statisticssquare-one/11-correlation-and-regression

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO-1 Understand the random experiments in real life situations **CLO-2** Understand the axioms of probability in real life situations. **CLO-3** Compute Bernoulli trials and understand the rare case population **CLO-4** Learn the usage of central tendencies, dispersion and skewness. **CLO-5** Obtain the relationship between two random variables.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-1

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		**Mathematics and Financial Statistics**					
Paper Number		**Elective – IV (Discipline Specific)**					
Category	Core	**Year**	II	**Credits**	4	**Course Code**	**23K3MECS4:2**
		Semester	III				
Instructional Hours Per week		**Lecture**	**Tutorial**	**LabPractice**	**Total**		
		4		--	4		
Pre-requisite		Basic Arithmetic and calculus					
Objectives of the Course		The main objectives of this course are: 1. To introduce the study of algorithms that used numerical approximation for the problems of Mathematical analysis. 2. To solve mathematical problems numerically					
Course Out line		**UNIT I** Probability review: Real valued random variables, expectation and variance, skewness and kurtosis, conditional probabilities and expectations. Discrete Stochastic Processes, Binomial processes, General random walks, Geometric random walks, Binomial models with state dependent increments.					
		UNIT II Tools Needed For Option Pricing: Wiener process, stochastic integration, and stochastic differential equations. Introduction to derivatives: Forward contracts, spot price, forward price, future price. Call and put options, zero-coupon bonds and discount bonds.					
		UNIT III Pricing Derivatives: Arbitrage relations and perfect financial markets, pricing futures, put-call parity for European options, relationship between strike price and option price. Stochastic Models in Finance: Discrete time process- binomial model with period one.					
		UNIT IV Stochastic Models in Finance: Continuous time process-geometric Brownian motion. Ito's lemma, Black-Scholes differential equation, Black-Scholes formula for European					

	options, Hedging portfolios: Delta, Gamma and Theta hedging. Binomial Model for European options: Cox-Ross-Rubinstein approach to option pricing. Discrete dividends.
	UNIT V Solution of Simultaneous Linear Algebraic Equations:Guass – Elimination Method, Guass–Jordan Method, Guass – Jacobi Method, Guass –Seidel Method. Finite Differences: Operators. Interpolation for Equal intervals: Newton's Forward Interpolation Formula and Newton's Backward Interpolation Formula, Evaluation of missing terms.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved (TobediscussedduringtheTutorialhour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Kandasamy, P., Thilagavathy, K. (2003): Calculus of Finite Differences and Numerical Analysis, S.Chand Publications. 2. Balasubramaniam and Venkatraman(1972): Numerical mathematics part I and II by Rochouse and Sons
Reference Books	1. Kalavathy, S., and Thomson. (2004): Numerical Methods, Vijay Nico::le Publications. 2. Gupta, B.D. (2004): Numerical Analysis, Konark Publications. 1. Venkatachalapathy, S.G. (2004): Calculus of Finite Differences and Numerical Analysis, Margam Publications. 2. Gerald Wheatley, (1970): Applied Numerical Analysis, Pearson Education Publications. 3. Jain, M.K., Iyengar, S.R., Jain, R.K., (1994): Numerical Methods Problems and Solutions, New Age International Publishers.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject www.nptel.com

CourseLearningOutcome(forMappingwithPOsandPSOs)

Studentswill beableto

CLO-1Solve numerically equations that cannot have direct solution
CLO-2solve system of linear equations
CLO-3understand the need of interpolation
CLO-4 handle numerical differentiation
CLO-5 do integration numerically
CLO-6 get a foundation on algorithms to solve a mathematical problem

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	S	S	M
CLO2	S	S	S	S	M	S	S	S	M
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
A.V.V.M. Govt. Arts College for Women (Autonomous), Thanjavur-1

HOD OF STATISTICS
G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Allied – Statistics For Mathematics - II Practical						
Paper Number	EC -V						
Category: Core	Year	II	Credits	2	Course Code	23K4MECS5P	
	Semester	IV					
Instructional Hours per week	Lecture	Tutorial		Lab Practice		Total	
	2	-		--		2	
Objectives of the Course	To impart knowledge about the basis of data analysis related to various activities like production, consumption, distribution, bank transactions, insurance and transportation.						
Course Outline	**UNIT – I Measures of Central Tendency and Dispersion** Computation of Measures of Central Tendency – Measures of Dispersion (absolute and relative measures) -Coefficient of Skewness.						
	UNIT – II Curve Fitting Method of least square – Fitting of a straight line and second degree Parabola, Fitting of Power Curve and Exponential Curves.						
	UNIT – III Theoretical Distributions Distributions – Fitting of Binomial distribution, Poisson distributions and Normal distribution – Testing the Goodness of fit.						
	UNIT – IV Correlation and Regression Computation of Karl Pearson's co-efficient of correlation – Spearman's rank correlation coefficient – Regression equations.						
	UNIT – V Large and Small Sample Tests Large sample tests with regard to Mean, Difference between Means, Proportions and Difference of Proportions. Small sample tests with regard to Mean, Difference between Means and Paired't' test , F –test, Chi-square test for independence of attributes.						

Note:

Question Paper Setting:

5 questions are to be set without omitting any unit. All questions carry equal marks. Any 3 questions are to be answered in 3 hours duration.

Examinations Distribution of Marks

University Examinations (Written Practical)	75 Marks
CIA (Including Practical Record)	25 Marks
Total	100 Marks

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

BOARD OF STUDIES
DEPT. OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course	Allied – Statistics For Mathematics - III						
Paper Number	EC-VI						
Category: Core	Year	II	Credits	3	Course Code	23K4MECS6:1	
	Semester	IV					
Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total			
	4	-	--	4			
Pre-requisite	Basis of Statistics						
Objectives of the Course	1. To equip students with theoretical knowledge for estimating unknown parameters. 2. To introduce the concepts of testing the hypothesis, significance and chisquare test..						
Course Outline	**UNIT – I Point Estimation** Population and Sample – Parameter and Statistic – Point Estimation – Consistency – Unbiasedness – Efficiency (Cramer – Rao inequality) and Sufficiency (Rao – Blackwell Theorem).						
	UNIT – II Methods of Estimation and Interval Estimation Maximum likelihood Estimator (MLE) and Methods of Moments – Properties of these estimators – Interval estimation (concept only).						
	UNIT – III Test of Significance Concept of Statistical Hypothesis – Simple and Composite Hypothesis – Null and Alternative Hypothesis – Critical region – Type I and Type II Errors – Power of a test – Neyman-Pearson Lemma.						
	UNIT – IV Test of Significance (Large Sample Tests) Sampling distribution – Standard error – Large sample tests with regard to Mean, Difference of Means, Proportions and Difference of Proportions – Simple Problems.						
	UNIT – V Test of Significance (Small Sample Tests) Exact sample test based on 't' and F Distributions with regard to Means, Variance and Correlation coefficient – Chi-square test , Goodness of fit and independence of attributes.						
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill						

References Books	1. Gupta. S. C. and Kapoor. V. K. (2004) – Fundamentals of Mathematical Statistics – (11_{th} Edition), Sultan Chand & Sons, New Delhi. 2. Saxena H.C, Statistical Inference, S. Chand & Company Private Ltd, New Delhi. 3. Goon A M, Gupta M K, Das Gupta B: Fundamentals of Statistics (Vol-I), The World Press Pvt. Ltd., Kolkata. 4. Mood A. M, Graybill F. A and Boes D. C (1983), Introduction to the theory of Statistics, McGraw Hill, New Delhi.
	5. Sancheti. D. C. and Kapoor. V. K. Statistics (7_{th} Edition), Sultan Chand & Sons, New Delhi. 6. Snedecor G.W and Cochran W.G., Statistical Methods, Oxford Press and IBH. 7. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi. 8. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi. 9. Vittal P. R, Mathematical Statistics, Margham Publications, Chennai. 10. Robert V. Hogg, Elliot A. Tanis, Probability and statistical inference, Macmillan.
Weblinks	http://www.sjsu.edu/faculty/gerstman/StatPrimer/estimation.pdf https://www.tutorialspoint.com/statistics/ https://www.statisticshowto.datasciencecentral.com/ https://www.investopedia.com/terms/c/chi-square-statistic.asp http://onlinestatbook.com/2/introduction/inferential.html

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

CLO-1 Know the importance of good estimators.

CLO-2 understand the importance of maximum likelihood estimator **CLO-3** know the difference types of estimators Cramer Rao inequality. **CLO-4** Learn the importance of statistical hypothesis for large samples.

CLO-5 Learn the importance of statistical hypothesis for small samples.

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
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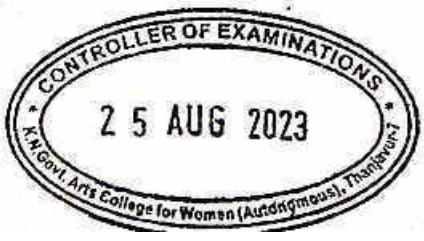
K.N. Govt. Arts College for Women (Autonomous), Thanjavur-7

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

Title of the Course		Actuarial Statistics					
Paper Number		EC - VI					
Category	Core	Year	II	Credits	3	Course Code	23K4MECS6:2
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		4		-	--	4	
Pre-requisite		Basic arithmetic					
Objectives of the Course		The main objectives of this course are: 1. It develops a greater understanding of statistical principles and their application in actuarial statistics. 2. Describe the core areas of actuarial practice and relate to those areas actuarial principles, theories and models. 3. It gives the understanding of the application knowledge of the life insurance environment.					
Course Outline		**Unit I** Simple and compound interest, present value and accumulated values of fixed rate, varying rate of interest					
		Unit II Mortality : Gompertz - Makeham laws of mortality - life tables. Annuities: Endowments, Annuities, Accumulations, Assurances, Family income benefits.					
		Unit III Policy Values : Surrender values and paid up policies, industrial assurances, Joint life and last survivorship, premiums.					
		Unit-IV Contingent Functions: Contingent probabilities, assurances. Decrement tables. Pension funds: Capital sums on retirement and death, widow's pensions, benefits dependent on marriage.					
		Unit-V Principles of insurance, pure endowment, whole life assurance, Net premium for assurance and annuity plans-level annual premium under temporary assurance .					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / I AI I/ IFoA thers to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this Course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					



Recommended Text	1. Hooker,P.F., Longley, L.H.-Cook (1957) : Life and other contingencies, Cambridge.
	2. Alistair Neill(1977) : Life contingencies, Heinemann professional publishing.
	3. Gupta and Kapoor (2001) Fundamentals of Applied Statistics
Reference Books	1. Study material of IAI/IFoA of Actuarial Societies
	2. Hosack,I.B., Pollard, J.H. and Zehnwirth, B.(1999) : introductory statistics with applications in general insurance, Cambridge University.
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1 : To explain the utility theory and insurance terminologies.

CLO2: To articulate the insurance and annuity benefits through multiple life functions evaluation for special mortality laws.

CLO3 : To describe the various types of premium and their numerical evaluations.

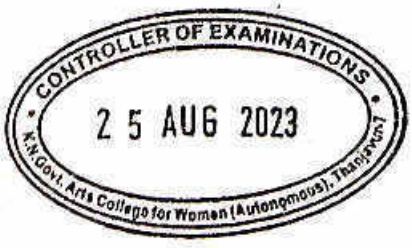
CLO4 : To explain implementation of the Life insurance policies.

CLO5: To describe Insurance payable at the moment of death and at the end of the year of death-level benefit insurance.

CLO6: To understand real life problems related to insurance

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	S	M	S	S	S	S
CLO2	S	S	S	S	M	S	S	S	S
CLO3	S	S	S	M	S	M	S	S	M
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	S	M	M	S	S	S	M
CLO6	S	M	M	S	M	S	S	S	M

CO-PO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak



CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur

HOD OF STATISTICS
K.N.G.A.C. (W) (AUTO)
THANJAVUR

SEMESTER –III

Skill Enhancement Course SEC-6

STATISTICAL APPLICATIONS FOR GEOGRAPHY –I- 23K3GECS4:1

TEACHING HOURS : 4

UNIT	LEARNING OBJECTIVES
CO1	To acquire the basic knowledge of data collection
CO2	To understand the need of basic statistical methods
CO3	To get the knowledge diagrammatic representation of statistical methods
CO4	To explore the basic knowledge of Time series and moving average
CO5	To acquire the knowledge of statistical analysis
CO6	Assessment Unit

UNIT	DETAILS	NO. OF HOURS	COURSE OBJECTIVES
I	Collection of data and formation of statistical tables- Importance of cross tabulation-	12	CO1
II	Measures of Central Tendency: Mean- Median- Mode- Measures of Dispersion: Range- Mean Deviation- Standard Deviation-Rank Correlation- Coefficient of Variation.	12	CO2
III	Diagrammatic Representation of Data- Bar, Histogram – Frequency Polygon and Curve - Ogives- Lorenz Curve- Gini Coefficient	12	CO3
IV	Time Series – Graphical Method – Semi Average – Moving Average.	12	CO4
V	Hypothesis Testing – 'T' Test – 'F' Test – Chi-Square Test.	12	CO5
VI	Assessment Unit		

UNIT	LEARNING OUTCOMES
	Understands the Purposes of data collection and its sources. Sampling is very essential to choose according to the types of data types and the purpose of the study.
	Understands of facts of hypothesis testing and need of hypotheses in research analysis. Explore the types of hypothesis and its significance and confidence level. **Examine** the relationship between Parametric and Non-parametric procedures through Chi-square test, 'T' test, 'F' test, Analysis of Variance (ANOVA).
VI	Assessment Unit

TEXT BOOK:

CONTROLLER OF EXAMINATIONS
25 AUG 2023
A.V.V.M. Sri Pushpam College for Women (Autonomous), Thanjavur

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THANJAVUR

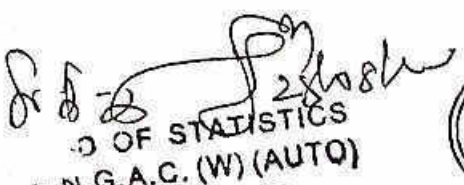
1	SahaPijushkanti (2010): Advanced Practical Geography, Books and Allied pvt Ltd.
2	Bagulia A.M (2006): Practical Geography, Anmol Publishers.
3	Zulfequar Ahmed Khan M.D (1997): Text book of Practical Geography, Concept Publishing Company , New Delhi.
WEB SOURCE:	
1	http://www.albert.io/blog/data-collection-methods-statistics/
2	http://sciencing.com/difference-between-cluster-factor-analysis-8175078.html

CO/PO/PSO	PO									
	1 Disp knowledge and skill	2 Skilled communicator	3 critical thinker and problem solver	4 Sense of inquiry	5 Team player/worker	6 Skilled project manager	7 Digitally efficient	8 Ethical awareness/ reasoning	9 National and International perspective	10 Lifelong learners
CO1	3	2	1	2	1	1	2	1	1	2
CO2	3	2	1	2	1	1	2	1	1	2
CO3	3	2	1	2	2	3	2	1	1	2
CO4	3	2	1	3	1	1	2	1	1	2
CO5	3	2	2	3	1	3	2	1	2	2
Copc5635	3	2	1	2	1	2	2	1	1	2
CO/PO/PSO										
Pc5635 Average	3	2	1	2	1	2	2	1	1	2
Correlation Average										

APPLIED STATISTICS – I -23K3GECS4:2			
TEACHING HOURS : 4			
UNIT	LEARNING OBJECTIVES		
CO1	To acquire the basic knowledge of data collection		
CO2	To understand the need of basic statistical methods		
CO3	To get the knowledge diagrammatic representation of statistical methods		
CO4	To explore the basic knowledge of Time series and moving average		
CO5	To acquire the knowledge of statistical analysis		
CO6	Assessment Unit		
UNIT	DETAILS	NO. OF HOURS	COURSE OBJECTIVES
I	Census method – sampling method, Non – probability sampling – Judgement sampling, Quota sampling – advantages and disadvantages, probability sampling – Simple random sampling, stratified random sampling, systematic sampling – sampling errors.	12	CO1
II	Vital statistics – Definition – Methods Fertility – crude birth rate, specific birth rate, general birth rate, total fertility rate, gross reproduction rate and Net reproduction rate – problems. Mortality – crude death rate, SDR life table – uses – problems.	12	CO2
III	Eigen values and Eigen vectors – power of matrix, Inverse of matrix – Cayley Hamilton – theorem (without proof) – simple problems	12	CO3
IV	Algebra – Binomial theorem – Expansion of rational fractions, summation of the series, approximation. Exponential series – expansion – summation of the series, logarithmic series – summation of the series– simple problems.	12	CO4
V	Matrices – Definition, Types of Matrices – Operations on matrices, Hamilton matrix, Orthogonal matrix, Rank of matrix. System of linear equations – Consistency – non-homogeneous linear equations, homogeneous linear equations, simple problems.	12	CO5
VI	Assessment Unit		
UNIT	LEARNING OUTCOMES		
	Understands the Purposes of data collection and its sources. Sampling is very essential to choose according to the types of data types and the purpose of the study.		

	Understands of facts of hypothesis testing and need of hypotheses in research analysis. Explore the types of hypothesis and its significance and confidence level. **Examine** the relationship between Parametric and Non-parametric procedures through Chi-square test, 'T' test, 'F' test, Analysis of Variance (ANOVA).
VI	Assessment Unit
Text Books and Reference	1. .Singaravelu – Allied Mathematics – (paper II) (1998) 2. S.P. Gupa – Statistical Methods (Revised Edition 2001) 3. S.P. Gupta – Fundamental of Applied Statistics.
1	SahaPijushkanti (2010): Advanced Practical Geography, Books and Allied pvt Ltd.
2	Bagulia A.M (2006): Practical Geography, Anmol Publishers.
3	Zulfequar Ahmed Khan M.D (1997): Text book of Practical Geography, Concept Publishing Company , New Delhi.
WEB SOURCE:	
1	http://www.albert.io/blog/data-collection-methods-statistics/
2	http://sciencing.com/difference-between-cluster-factor-analysis-8175078.html

CO/PO/PSO	PO									
	1 Dispknowledge and skill	2 Skilled	3 critical thinker and probl	4 Sense of inquiry	5 Team player/worker	6 Skilled project manager	7 Digitally efficient	8 Et	9 National and Interna tional perspe	10 Lifelong learners
CO1	3	2	1	2	1	1	2	1	1	2
CO2	3	2	1	2	1	1	2	1	1	2
CO3	3	2	1	2	2	3	2	1	1	2
CO4	3	2	1	3	1	1	2	1	1	2
CO5	3	2	2	3	1	3	2	1	2	2
Copc5635	3	2	1	2	1	2	2	1	1	2
CO/PO/PSO										
Pc5635 Average	3	2	1	2	1	2	2	1	1	2
Correlation Average										



SEMESTER –IV			
Skill Enhancement CourseSEC-6			
STATISTICAL APPLICATIONS FOR GEOGRAPHY PRACTICAL-II - 23K4GECS5P (Calculator Based)			
TEACHING HOURS : 2			
UNIT	LEARNING OBJECTIVES		
CO1	To acquire the basic knowledge of data collection		
CO2	To understand the need of basic statistical methods		
CO3	To get the knowledge diagrammatic representation of statistical methods		
CO4	To explore the basic knowledge of Time series and moving average		
CO5	To acquire the knowledge of statistical analysis		
CO6	Assessment Unit		
UNIT	DETAILS	NO. OF HOURS	COURSE OBJECTIVES
I	Diagrammatic Representation of Data- Bar, Histogram – Frequency Polygon and Curve - Ogives- Lorenz Curve- Gini Coefficient	12	CO1
II	Measures of Central Tendency: Mean- Median- Mode- Measures of Dispersion: Range- Mean Deviation- Standard Deviation-Rank Correlation- Coefficient of Variation.	12	CO2
III	Karl Pearson's – Bowley's - methods. Correlation and Rank Correlation- Coefficient of Variation.	12	CO3
IV	Time Series – Graphical Method – Semi Average – Moving Average.	12	CO4
V	Hypothesis Testing – 'T' Test – 'F' Test – Chi-Square Test. Analysis of Variance(ANOVA)	12	CO5
VI	Assessment Unit		
	LEARNING OUTCOMES		
	Understands the Purposes of data collection and its sources. Sampling is very essential to choose according to the types of data types and the purpose of the study.		
	Understands of facts of hypothesis testing and need of hypotheses in research analysis. Explore the types of hypothesis and its significance and confidence level. **Examine** the relationship between Parametric and Non-parametric procedures through Chi-square test, 'T' test, 'F' test, Analysis of Variance (ANOVA).		
VI	Assessment Unit		
TEXT BOOK:			

CO/PO/PSO	PO									
	1 Disp knowledge and skill	2 Skilled communicator	3 critical thinker and problem solver	4 Sense of inquiry	5 Team player/worker	6 Skilled project manager	7 Digitally efficient	8 Ethical awareness/ reasoning	9 National and International perspective	10 Lifelong learners
CO1	3	2	1	2	1	1	2	1	1	2
CO2	3	2	1	2	1	1	2	1	1	2
CO3	3	2	1	2	2	3	2	1	1	2
CO4	3	2	1	3	1	1	2	1	1	2
CO5	3	2	2	3	1	3	2	1	2	2
Cope5635 CO/PO/PSO	3	2	1	2	1	2	2	1	1	2
Pe5635 Average	3	2	1	2	1	2	2	1	1	2
Correlation Average										

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THANJAVUR

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SEMESTER –IV			
Skill Enhancement Course SEC-6			
RESEARCH ANALYTICAL TECHNIQUES – III – 23K4GECS6:1			
TEACHING HOURS : 4			
UNIT	LEARNING OBJECTIVES		
CO1	To understand the need of data sources and significance of sampling in research.		
CO2	To have empirical knowledge on types of hypothesis testing and also parametric and non-parametric		
CO3	To have depth understanding on the bivariate analysis		
CO4	To assess the need for multivariate analysis in Geographical Research		
CO5	To design and thorough understanding in trend surface and models		
CO6	Assessment Unit		
UNIT	DETAILS	NO. OF HOURS	COURSE OBJECTIVES
I	Data Collection – Data Sources – Data Types – Primary, Secondary – Sampling – Simple Random – Stratified – Nesting.	12	CO1
II	Hypothesis Testing – Needs and Types of hypothesis – Goodness of fit and significance and confidence levels – Parametric and Non – Parametric procedures : Chi – square test, 't' test, 'F' test, Analysis of Variance(ANOVA)	12	CO2
III	Bivariate Analysis : Scatter diagram – Simple linear – Spearman's Rank and Product Moment Correlation Coefficients, Regression – Residuals and their Mapping.	12	CO3
IV	Multivariate Analysis : Basic Principles and elements of Factor Analysis – Principal – Cluster Analysis.	12	CO4
V	Trend Surface and Models : Gravity Models – Population Potential – Index of Concentration – Growth rate Scalogram.	12	CO5
VI	Assessment Unit		
UNIT	LEARNING OUTCOMES		
I	**Understands** the Purposes of data collection and its sources. Sampling is very essential to choose according to the types of data types and the purpose of the study.		
II	**Understands** of facts of hypothesis testing and need of hypotheses in research analysis. Explore the types of hypothesis and its significance and confidence level. **Examine** the relationship between Parametric and Non-parametric procedures through Chi-square test, 'T' test, 'F' test, Analysis of Variance (ANOVA).		
III	**Understands** Bivariate Analysis, and methods to be followed to analyses for socio economic data analysis through scatted diagrams, simple linear and regression, Rank		

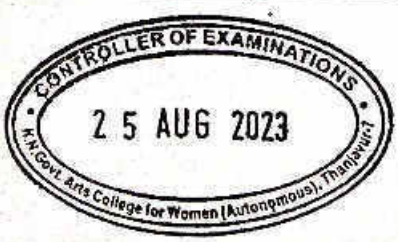
	correlation and product moment correlation coefficients and residuals and their mapping.
IV	**Multivariate Analysis** and Explore the basic Principles and elements of Factors Analysis, apply factor analysis in SPSS (principal component analysis for a set of population data based to acquire the knowledge for data analysis and interpretation.
VI	Assessment Unit

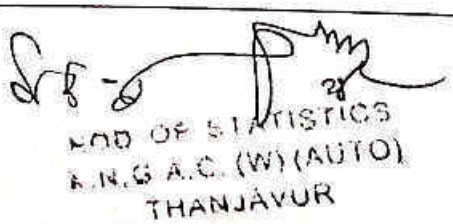
TEXT BOOK:

CO/PO/PSO	PO									
	1 Disp knowledge and skill	2 Skilled communicator	3 critical thinker and problem solver	4 Sense of inquiry	5 Team player/worker	6 Skilled project manager	7 Digitally efficient	8 Ethical awareness/ reasoning	9 National and International perspective	10 Lifelong learners
CO1	3	2	1	2	1	1	2	1	1	2
CO2	3	2	1	2	1	1	2	1	1	2
CO3	3	2	1	2	2	3	2	1	1	2
CO4	3	2	1	3	1	1	2	1	1	2
CO5	3	2	2	3	1	3	2	1	2	2
Copc5635	3	2	1	2	1	2	2	1	1	2
CO/PO/PSO										
Pc5635 Average	3	2	1	2	1	2	2	1	1	2
Correlation Average										

SEMESTER –III

Skill Enhancement Course SEC-6





SEMESTER –IV			
Skill Enhancement Course SEC-6			
APPLIED STATISTICS – III— 23K4GECS6:2			
TEACHING HOURS : 4			
UNIT	LEARNING OBJECTIVES		
CO1	To understand the need of data sources and significance of sampling in research.		
CO2	To have empirical knowledge on types of hypothesis testing and also parametric and non-parametric		
CO3	To have depth understanding on the bivariate analysis		
CO4	To assess the need for multivariate analysis in Geographical Research		
CO5	To design and thorough understanding in trend surface and models		
CO6	Assessment Unit		
UNIT	**DETAILS**	**NO. OF HOURS**	**COURSE OBJECTIVES**
I	Analysis of Time series – uses, components of time series, measurements of trend – Free hand method, Semi – average method moving Average method and Method of least squares – Problems.	12	CO1
II	Business forecasting: steps in methods of forecasting, choice of forecasting – theories of business forecasting.	12	CO2
III	Integration – Definition. Important results (simple problems). Integration by the method of substitution (9 important formulas). Trigonometric Substitution- simple problems.	12	CO3
IV	Integration of Rational algebraic function. Type I - $\int P(x)/Q(x)$ - problems. Integration by the method of partial fractions- Simple problems. Type II – partial fractions. Type III - $\int \frac{dx}{ax + bx + c}$ and simple problems.	12	CO4
V	Reduction formula for $\int \sin^n x dx, \int \cos^n x dx, \int \sin^m x \cos^n x dx, \int \tan^n x dx$ - simple problems.	12	CO5
VI	Assessment Unit		
UNIT	**LEARNING OUTCOMES**		

I	**Understands** the Purposes of data collection and its sources. Sampling is very essential to choose according to the types of data types and the purpose of the study.
II	**Understands** of facts of hypothesis testing and need of hypotheses in research analysis. Explore the types of hypothesis and its significance and confidence level. **Examine** the relationship between Parametric and Non-parametric procedures through Chi-square test, 'T' test, 'F' test, Analysis of Variance (ANOVA).
III	**Understands** Bivariate Analysis, and methods to be followed to analyses for socio economic data analysis through scatted diagrams, simple linear and regression, Rank correlation and product moment correlation coefficients and residuals and their mapping.
IV	**Multivariate Analysis** and Explore the basic Principles and elements of Factors Analysis, apply factor analysis in SPSS (principal component analysis for a set of population data based to acquire the knowledge for data analysis and interpretation.
VI	Assessment Unit
Text Books and Reference	1. Calculus Vol-II, S.Narayanan, T.K.Manicavachagom Pillay(2010). 2. A. Singaravelu – Allied Mathematics – I (2002). 3. S.P.Gupta – StatisticalMethods (Revised Edition 2001).

CO/PO/PSO	PO									
	1 Disp knowledge and skill	2 Skilled	3 critical thinker and pro	4 Sense of inquiry	5 Team player worker	6 Skilled project manager	7 Digitally efficient	8 E t	9 National and Intern ation al persp	10 Lifelong learners
CO1	3	2	1	2	1	1	2	1	1	2
CO2	3	2	1	2	1	1	2	1	1	2
CO3	3	2	1	2	2	3	2	1	1	2
CO4	3	2	1	3	1	1	2	1	1	2
CO5	3	2	2	3	1	3	2	1	2	2
Cope5635	3	2	1	2	1	2	2	1	1	2
CO/PO/PSO										
Pe5635 Average	3	2	1	2	1	2	2	1	1	2
Correlation Average										

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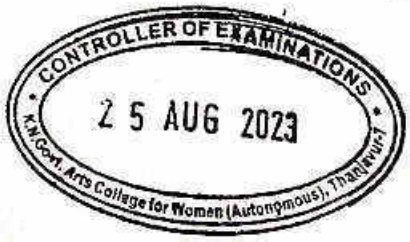
Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3BBECBB3:1	BUSINESS STATISTICS (EC-III)	Generic Elective	Y	-	-	-	3	4	25	75	100

Learning Objectives	
CLO1	Apply the Measures of Central Tendency in business
CLO2	Understanding the Measures of Variation
CLO3	Analyze of Time Series
CLO4	Understand Index Numbers and Statistical quality control
CLO5	Testing of hypothesis

UNIT	Details	No. of Hours	Learning Objectives
I	Introduction – Meaning and Definition of Statistics – Collection and Tabulation of Statistical Data – Presentation of Statistical Data – Graphs and Diagrams- Measures of Central Tendency – Arithmetic Mean, Median and Mode – Harmonic Mean and Geometric Mean.	12	CLO1
II	Measures of Variation – Standard Deviation –Mean deviation – Quartile deviation- Skewness and kurtosis – Lorenz Curve –Simple Correlation – Scatter Diagram – Karl Pearson's Correlation – Rank Correlation – Regression.	12	CLO2
III	Analysis of Time Series – Methods of Measuring Trend and Seasonal Variations	12	CLO3
IV	Index Numbers – Consumer Price Index – And Cost of Living Indices.	12	CLO4



V	Testing of hypothesis – Chi-Square test, T Test, F Test, ANOVA.	12	CLO5
		60	

Course Outcomes

Course Outcomes	On Completion of the course the students will	Program Outcomes
CO1	Measures of Central Tendency	PO1,PO2,PO4,PO6
CO2	**Measures of Variation**	PO1,PO2,PO6
CO3	Analyze of Time Series	PO1,PO2,PO6
CO4	Understand Index Numbers	PO1,PO2,PO6
CO5	Test Hypothesis	PO2,PO8

Reading List

1.	P.R. Vittal, Business Mathematics and Statistics, Margham Publications, Chennai,2004.
2.	S.P. Gupta, Statistical Methods, Sultan Chand &Sons, NewDelhi,2007.
3.	S.P. Gupta, Elements of Business Statistics, Sultan Chand & Sons, NewDelhi,2007.
4.	J.K. Sharma, Business Statistics, Pearson Education, New Delhi,2007.
5.	Business Statistics & OR - Dr. S. P. Rajagopalan, Tata McGraw-Hill

References Books

1.	David M.Levine, David F.Stephan etal. Business Statistics : A first Course, 7th edition
2.	Dina Nath Pandit, Statistics: A Modern Approach , Hindustan Publishing Corporation

3.	Hazarika Padmalochan,A textbook of Business Statistics , S.Chand Publications
4.	Vohra ND, Business Statistics: Text and Problems – With Introduction to Business Analytics, Mc Graw Hill ,2021
5.	Alexander Holmes, Barbara Illowsky and Susan Dean, Introductory Business Statistics , 12th Media Services, 2017

Web Resources	
1	https://theintactone.com/2019/09/01/ccsubba-204-business-statistics/
2	https://ug.its.edu.in/sites/default/files/Business%20Statistics.pdf
3	http://www.statisticshowto.com
4	https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/
5	https://www.toppr.com/guides/business-mathematics-and-statistics/index-numbers/

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks

Methods of Assessment	
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/	MCQ, True/False, Short essays, Concept explanations, Short summary or

Comprehend (K2)	overview
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	M	S	S	S	M	S
CO2	S	S	M	M	M	S	M	S
CO3	S	S	M	M	S	S	M	S
CO4	S	S	M	M	M	S	M	S
CO5	S	S	M	S	S	S	M	S

CO-PO Mapping (Course Articulation Matrix)

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PO's	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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Title of the Course	Statistics and Mathematics for Management					
Paper Number	Elective III (Discipline Specific)					
Category	Core	Year	II	Credits	3	Course Code	23K3BBECBB3:2
		Semester	III				
Instructional Hours Per week	Lecture	Tutorial	Lab Practice	Total		
	3	1	--	4		
Pre-requisite	Calculus – Basic arithmetic					
Objectives of the Course	The main objectives of this course are: 1. The overall objective of the study is to create deep interest in learning mathematics which develop broad and balance knowledge and understanding definitions, concepts, principles and theorems. 2. It helps the students to enhance the ability of learners to apply the knowledge and skill acquired by them to solve specific theoretical and applied problems in mathematics. 3. It also encourages the students to develop a range of generic skill helpful in employment, internships in social activities.					
Course Outline	**Unit-I** Census method – sampling method, Non – probability sampling – Judgement sampling, Quota sampling – advantages and disadvantages, probability sampling – Simple random sampling, stratified random sampling, systematic sampling – sampling errors.					
	Unit-II Vital statistics – Definition – Methods Fertility – crude birth rate, specific birth rate, general birth rate, total fertility rate, gross reproduction rate and Net reproduction rate – problems. Mortality – crude death rate, SDR life table – uses – problems.					
	Unit-III Eigen values and Eigen vectors – power of matrix, Inverse of matrix – Cayley Hamilton – theorem (without proof) – simple problems .					
	Unit-IV Algebra – Binomial theorem – Expansion of rational fractions, summation of the series, approximation. Exponential series – expansion – summation of the series, logarithmic series – summation of the series– simple problems.					
	Unit-V Matrices – Definition, Types of Matrices – Operations on matrices, Hamilton matrix, Orthogonal matrix, Rank of matrix. System of linear equations – Consistency – non-homogeneous linear equations,					

	equations, homogeneous linear equations, simple problems.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Duraipandian, P. and Udaya Baskaran, S. (2014): Allied Mathematics, Vol. – I&II,S. Chand& Company Pvt. Ltd. 2. Vittal, P.R(2012). Allied Mathematics, Margham Publications. 3. Narayanan,S ManickavachagamPillai(1993): Ancillary Mathematics, Book II : (Containing Differential Calculus) S. Viswanathan Pvt, Ltd .
Reference Books	1. Narayanan,S and ManickavachagamPillai (1993): Ancillary Mathematics (Vol. II,Part I) : (Containing Trignometry) S. ViswanathanPvt. Ltd . 2. Narayanan, S and ManickavachagamPillai (1993): Ancillary Mathematics, Book I : (Containing Algebra). S. Viswanathan Pvt.Ltd . 3. S.J.Venkatesan (2019), Algebra,Sri Krishna Publications ,Chennai-77 , skhengg1999@gmail.com
Website and e-Learning Source	e-books, tutorials on MOOC/SWAYAM courses on the subject

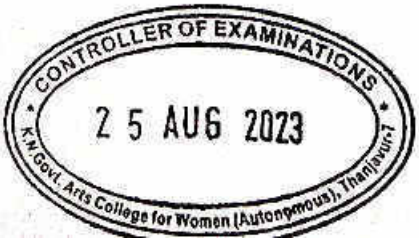
Course Learning Outcome(for Mapping with POs and PSOs)

Students will be able to

CLO-1 Distinguish between proper and improper fractions. Express an algebraic fraction as the sum of its partial fractions.

CLO-2 Demonstrate the knowledge to determine the sums, expansion and approximation of series including binomial, exponential, logarithmic and fourier.

CLO-3 Solve problems about polynomials with real coefficients, imaginary and irrational roots. Explain the relationship between the derivative of a function as a function and the notion of the derivative.



CLO-4 Calculate limits of a function.

CLO-5 Obtain the nth derivative in successive differentiation. Apply Euler's theorem on homogenous function

CLO-6Obtain the mathematical knowledge and skills for the better understanding of statistics as a mathematical science

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M
CLO6	S	S	S	S	M	S	S	M	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3BBECBB4:1	OPERATION RESEARCH (EC-IV)	Generic Elective	Y	-	-	-	3	4	25	75	100

Learning Objectives

CLO1	Introduction to Operations Research definition and concept Essential features of LPP.
CLO2	Formulation of Transportation problem and finding an initial basic feasible solution.
CLO3	Expressing Assignment problem, Hungarian method- Minimization and Maximization case and Sequencing Problem.
CLO4	Analyse Network models and constructing network- critical path, various floats.
CLO5	Analyse Game Theory and Decision Theory

UNIT	Details	No. of Hours	Learning Objectives
I	Linear Programming problem -Concept and scope of OR, general mathematical model of LPP, steps of L.P model formulation, Graphical method of the solution of LPP-simple problems.	12	CLO1
II	Transportation problem- Basic definitions, formulation of transportation problem as LPP, finding an initial basic	12	CLO2

	feasible solution- North -west corner rule, row minima method, column minima method, least cost entry method- Vogel's approximation method to find the optimal solution.		
III	Assignment problem-Hungarian method- Minimization and Maximization case, unbalanced assignment problem. Sequencing Problem-Processing n jobs on 2 machines, processing n jobs on 3 machines, processing n jobs on m machines.	12	CLO3
IV	Network models-PERT and CPM — difference between PERT and CPM- constructing network- critical path, various floats, three-time estimates for PERT	12	CLO4
V	Game Theory- Maximin-Minmax criterion, Saddle point, Dominance property, Graphical method for solving 2xn and mx2 game. Decision Theory –statement of Baye'stheorem application - decision trees.	12	CLO5
		60	

Course Outcomes	On Completion of the course the students will	**Program Outcomes**
CO1	Analyse Linear Programming	PO1,PO2,PO6
CO2	Analyse Transportation problem	PO1,PO2,PO6
CO3	Analyse Assignment problem	PO1,PO2,PO6
CO4	Analyse Network models	PO1,PO2,PO6
CO5	Analyse Game Theory and Decision Theory	PO1,PO2,PO6

Reading List

1. Operational Research | Research.com
2. Operations Research | PubsOnLine (informs.org)
3. Prabandhan : Journal of Management

4.	International Journal of Operations research
5.	DR H. Premraj, Elements of Operation Research, Margham publications, Chennai, 2019

Reference Books

1.	P.R. Vittal& V. Malini, Operative Research – Margham Publications Chennai – 17.
2.	P.K. Gupta& Man Mohan, Problems in Operations Research – Sultan Chand & sons – New Delhi
3.	V.K. Kapoor, Introduction to operational Research – Sultan Chand & sons – New Delhi
4.	Hamdy A Taha, Operation Research – An Introduction prentice Hall of India- New Delhi
5.	P. Gupta, H. Aruna Rani, M. Haritha (2018), Operations Research and Quantitative Techniques, First edition, Himalaya Publishing House.

Web Resources

1	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.rcmindore.com/wp-content/uploads/2021/04/Operations-Research.pdf
2	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.bhu.ac.in/dept/UIET/EMBR001%20Operation%20Research%20Queuing%20theory.pdf
3	https://www.onlinemathlearning.com › linear-programming-example
4	https://www.kellogg.northwestern.edu › weber › Notes_6_Decision_trees
5	www.pondiuni.edu.in › sites › default › files

Methods of Evaluation

Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	

	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks

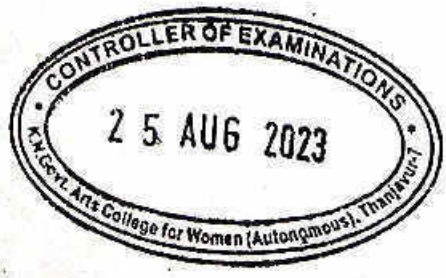
Methods of Assessment

Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

Mapping with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	M	M	M	S	M	S
CO2	S	S	M	M	S	S	M	S
CO3	S	S	M	M	S	S	M	S
CO4	S	S	M	M	M	S	M	S
CO5	S	S	M	M	M	S	M	S

CO-PO Mapping (Course Articulation Matrix)



CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to PO's	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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Title of the Course	Time Series / Index Numbers
Paper Number	Elective IV
Category: Core	Year: II; Semester: IV; Credits: 4; Course Code: 23K4BBSTCBSE2
Instructional Hours per week	Lecture: 4; Tutorial: -; Lab Practice: -; Total: 4
Pre-requisite	
Objectives of the Course	1. On successful completion of this course, students will be able to acquire the knowledge of time series data and its applications. 2. Outline the growth curves and their fitting. 3. To compute the different index numbers in real life problems. 4. To calculate the seasonal indices by various methods. 5. To analyse the importance of a good index number.
Course Outline	**Unit I Time Series** Definition, uses, Additive Model, Multiplicative Models, Components - Secular Trend, Seasonal variation - Measurement of Trend: Graphical method, Method of Semi - Averages, Method of Moving Averages and Method of Least Squares.
	UNIT II Measurement of Seasonal Variations Method of Simple Averages, Ratio to Moving Average method, Ratio to Trend Method and Link Relative Method - Cyclic Variation and Irregular fluctuations.
	Unit III Growth Curves Modified Exponential Curve and its Fitting – Method of Three Selected Points – Method of Partial Sums – Fitting of Gompertz Curve – Logistic Curve, De-Seasonalisation of data - Measurement of Cyclic variations by residual approach.
	Unit IV Index Numbers Definition, Uses, Types, Problems involved in the construction of Index Numbers – Construction of Index Numbers – Simple aggregate method and Simple average of Price relatives method. Weighted Index Numbers – Laspeyre's, Paasche's, Dorbish Bowley's, Marshall Edge worth's Index Numbers and Fisher's Ideal Index Number.
	Unit V Tests for adequacy Time Reversal Test, Factor Reversal Test, Unit test and Cyclic test. Definition of Deflation, Splicing, Inflation, and Real wages. Construction of Weighted Average of Price relatives Index Numbers using A.M & G.M. Fixed Base Index Numbers and Chain Base Index Numbers.

Extended Professional Component (is a part of internal component only, Not to be included in the	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
External Examination question paper)	
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Books.	Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Co., 4 th Revised Edition, 2019. Unit-I Chapter 2 (Sec: 2.1-2.3, 2.4, 2.4.1-2.4.3, 2.4.5) Unit-II Chapter 2 (Sec: 2.5, 2.5.1-2.5.4) Unit-III Chapter 2 (Sec:2.4, 2.4.4, 2.5, 2.5.5) Unit-IV Chapter 3 (Sec:3.1, 3.3:3.3.1-3.3.3) 43 Unit-V Chapter 3 (Sec: 3.3.4, 3.4, 3.4.1-3.4.4, 3.5, 3.5.2-3.5.3, 3.6)
References Books	1. Garret, H.E., Education and Psychological Statistics, Paragan International Publications, 2005. 2. Pillai RSN and Bagavathi V, Statistics, S. Chand & Co., 2010. 3. Box, G.E.P., Jenkins, G.M., Reinsel, G.C. and Ljung, G.M. Time Series Analysis: Forecasting and Control, 5th Edition, John Wiley & sons, Inc., 2015. 4. Brockwell, P.J. and Davis, R.A., Introduction to Time Series Analysis. Springer, 2003.

Course Learning Outcome (for Mapping with POs and PSOs) Students will be able to

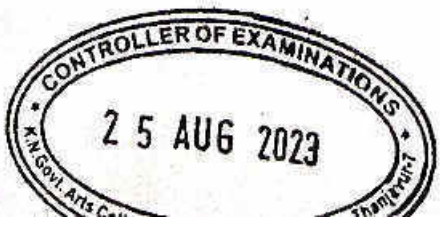
CLO-1 Understand the time series concept

CLO-2 estimate the trend values using various methods

CLO-3 concept and purposes of index numbers

CLO-4 understand the notation and formulae concerning the use.

CLO-5 understand time series data its components and its application in various fields.



	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CLO1	S	S	M	M	M	S	M	S	M
CLO2	S	S	S	S	M	S	M	S	M
CLO3	S	S	S	M	S	S	M	S	S
CLO4	S	S	S	M	S	S	S	S	M
CLO5	S	S	M	M	M	S	S	S	M

CLO-PSO Mapping (Course Articulation Matrix) S-Strong, M-Medium, W-Weak

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

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