

DEPARTMENT OF MATHEMATICS				CLASS: II B.Sc. Mathematics				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Major	20U3MMC5	Mathematical Statistics	3	4	25	75	100

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

Objectives:

1. To learn the Basic concepts about Axiomatic and Mathematical approach to find Probability, Conditional probability of events and Baye's theorem.
2. To understand Distribution functions of Discrete and Continuous type random variables, and to Calculate Marginal, Conditional distributions, Mathematical Expectations, Variance,, Covariance.
3. To acquire knowledge of Sampling Distributions, Testing Hypothesis, Type I, Type II errors, Evaluate and interpret Powers of Test, Critical region, Level of Significance, One/Two tailed tests Critical Value and large sample test.
4. To study and analyse about the small sample tests based on t, F and χ^2 distributions.

Unit	Description	Hours	K-level	CLO
I	Definitions of various terms – Axiomatic Probability – Random Event – Mathematical Probability – Addition and Multiplication Laws of Probability – Independent Events – Conditional Probability_ Baye's Theorem – Simple applications.	12	Up to K3	CLO1
II	Distribution functions – Discrete random variable – Continuous random variable- Joint Probability mass function Joint Probability distribution function – Marginal distribution function – Joint density function – conditional distribution function.	18	Up to K4	CLO2
III	Mathematical Expectation – Addition and Multiplication theorem – Covariance Expectation and Variance of linear combination of random variables - Moment generating function – Characteristic function – Probability generating function.	20	Up to K4	CLO3
IV	Sampling Distributions – Student's t-distribution, F-distributions - χ^2 - distribution (Definition and derivation only. Testing statistical hypothesis: Null and alternative hypothesis – Type I and Type II errors – Powers of attest – Critical region – Level of Significance – One/Two tailed tests critical value. Large Sample test: Test of Significance for mean and difference of means.	22	Up to K3	CLO4
V	Small Sample Test – Tests based on t, F and χ^2 distributions.	18	Up to K4	CLO5

Text Book:

VITTAL P R Mathematical Statistics -2004-Maragatham Publishers.

Chapters: UNIT I Ch.1,

UNIT II Ch 2,

UNIT III Ch 3,4,5,6 (Relevant Topics only)

UNIT IV Ch 22,24 (Relevant Topics only)

UNIT V Ch 25,26,27 (Relevant Topics only)

Reference Books:

1. Kandasamy, P.K.Thilagavathi and K.Gunavathi, PROBABILITY, STATISTICS,AND QUEUEING THEORY –(2007) S.chand and co. New Delhi.
2. S. C. Gupta , V .K Kapoor FUNDAMENTALS OF MATHEMATICAL STATISTICS-2002 Sultan Chand & Sons, New Delhi – Eleventh thoroughly revised edition.
3. Veerarajan T. FUNDAMENTALS OF MATHEMATICAL STATISTICS, Yesdee Publishing Private Ltd. 2017
4. Arumugam and Thangapandi Issac- STATISTICS ,New Gamma Publishing House,2016.

Web Resources:

1. <http://nptel.ac.in>
2. <http://www.ocw.mit.edu>
3. <https://www.khanacademy.org>
4. <http://onlinestatbook.com/2/introduction/descriptive.html>
5. <https://www.statistichowto.datasciencecentral.com/probability-and-statistics/descriptive-statistics/>

Pedagogy:

Lecture, Seminar, Quiz, Problem Solving, Tutorial, Seminar, Power Point Presentation.

Rationale for Nature of the course:

Thinking critically and applying basic mathematics skills to interpret data, draw conclusions, and solve problems; developing proficiency in making decisions based on data and make predictions ; Application of reasoning in quality testing.

Course Learning Outcomes

On successful completion of the course, students will be able to

Number	Course Learning Outcome	Knowledge level
CLO1	Learn about Probability, Conditional probability, Bayes's theorem	Up to K3
CLO2	Understand the concepts of discrete and continuous type random variables, distribution/density functions and find variants: joint, marginal, conditional probability distribution/density functions	Up to K4
CLO3	Apply techniques to find Expectation, Variance, Covariance and of random variables and linear combinations of random variables.	Up to K4
CLO4	Know about t-, F, χ^2 -distributions, and find Type I Type II errors, Critical region, level of significance and Large sample test	Up to K3
CLO5	Know how to do small sample test based on t,F, χ^2 distributions	Up to K4

K1 – Remembering and recalling facts with specific answers

K2 - Basic understanding of facts and stating main ideas with general answers

K3 – Application Oriented- solving problems

K4 - Examining, analyzing, presentation and make inference with evidences.

Mapping of Course Outcomes with Program Outcomes & Program specified outcomes

-CLOs with PSOs

CLOs/PO & PSOs	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CLO1	3	3	2	3	2	3	2	3	2	3	3	2
CLO2	3	3	2	3	2	3	3	3	3	3	3	3
CLO3	3	3	2	3	3	3	3	3	3	1	3	3
CLO4	3	3	2	3	2	3	2	3	2	3	3	1
CLO5	3	3	2	3	2	3	2	3	-	1	3	2

1.Basic level

2. Intermediate level

3.Advance level

BLUE PRINT**Mapping with Course Learning Outcomes(CLOs)**

S. No.	CLOs	K Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of questions	K Level	No. of questions	K level		
1	CLO 1	Up to K2	2	K1 & K2	1	K1	2(K2 & K2)	1(K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4 & K4)	1(K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K1	2(K3 & K3)	1(K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2(K3 & K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2 - Basic understanding of facts and stating main ideas with general answers

K3 - Application oriented - Solving Problems

K4 - Examining, analyzing, presentation and make inferences with evidences

Distribution of section wise marks with K levels

K Levels	Section A (No choice)	Section B (No choice)	Section C (Either/ or)	Section D (Open Choice)	Total marks	% of marks without choice	Consolidated
K1	5	4	-	-	9	7.5	42%
K2	5	6	20	10	41	34.17	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total marks	10	10	50	50	120	100	100%

BLUE PRINT – CIA – I

Mapping with Course Learning Outcomes(CLOs)

Sl. No	CLOs	K level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K Level	No. of Questions	K Level		
1	CLO 1	Up to K2	2	K1 & K1	1	K1	2(K2 & K2)	1(K2)
2	CLO 2	Up to K3	2	K1 & K1	2	K2	2(K3 & K3)	2(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each question			1		2		5	10
Total Marks for each Section			4		6		10	20

K1 - Remembering and recalling facts with specific answers

K2 - Basic understanding of facts and stating main ideas with general answers

K3 - Application oriented - Solving Problems

K4 - Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K levels

K Levels	Section A (No choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total marks	% of marks without choice	Consolidated
K1	4	2	-	-	6	10	50%
K2	-	4	10	10	24	40	
K3	-	-	10	20	30	50	50%
K4	-	-	-	-	-	-	-
Total marks	4	6	20	30	60	100	100%

BLUE PRINT – CIA – II

Mapping with Course Learning Outcomes(CLOs)

Sl.No	CLOs	K level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K2 & K2)	2(K2&K4)
2	CLO 4	Up to K3	2	K1 & K2	2	K1&K2	2(K3 & K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each question			1		2		5	10
Total Marks for each Section			4		6		10	20

K1 - Remembering and recalling facts with specific answers

K2 - Basic understanding of facts and stating main ideas with general answers

K3 - Application oriented - Solving Problems

K4 - Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K levels

K Levels	Section A (No choice)	Section B (No choice)	Section C (Either/ or)	Section D (Open choice)	Total marks	% of marks without choice	Consolidated
K1	2	2	-	-	4	6.67	50%
K2	2	4	10	10	26	43.33	
K3	-	-	10	10	20	33.33	33%
K4	-	-	-	10	10	16.67	17%
Total marks	4	6	20	30	60	100	100%

Lesson Plan

Unit	Description	Hours	Pedagogy
I	Definitions-Axiomatic Probability-Random Event-Mathematical Probability-Addition and Multiplication Laws of Probability	6	Lecture, Quiz
	Independent Events-Conditional Probability-Bayes's theorem-applications.	6	Problem Solving
II	Random Variables-Distribution functions	2	Lecture, Quiz
	Discrete random variable-Continuous random variable	3	Quiz
	Joint Probability mass function Joint Probability distribution function	3	Lecture, Problem
	Marginal distribution function, Joint density function	4	Lecture, Group
	Conditional distribution function	6	Problem
III	Mathematical expectation –Addition and Multiplication theorem	4	Lecture
	Covariance Expectation and linear combination of random variables	8	Lecture
	Moment generating function	4	Problem
	Characteristic function, Probability generating function	4	Problem
IV	Sampling distribution, Students t- distribution, F-distribution, χ^2 -distribution,(Definition, Derivation only)	6	Lecture
	Testing statistical hypothesis: Null and alternative hypothesis, Type I and Type II errors	6	Lecture, Seminar
	Powers of test- Critical region-Level of significance-	4	Tutorial
	One/two tailed tests critical value.	2	Problem
	Large sample test: Test of significance for mean and difference of means	4	Problem Solving
V	Tests based on t- distribution	6	Lecture
	Tests based on F- distribution	6	Lecture
	Test based on χ^2 -distribution	6	Lecture
Total Hours		90	

Course Designer:

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