

CODE	COURSE TITLE
18MCUA101	MATHEMATICAL STATISTICS - I

Category	CIA	ESE	L	T	P	Credit
Allied - I	25	75	100	5	-	5

Preamble

To study the basic concepts in statistics such as random variables, distributions of discrete and continuous type, bivariate distributions and functions of random variables

Prerequisite

- Knowledge about probability theory, conditional probability and Baye's theorem

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic ideas of discrete distributions	K1
CO2	Relate the basic concepts of continuous distributions	K1
CO3	Compare the tools of bivariate distributions	K2
CO4	Learn and apply the functions of random variables	K3
CO5	Utilize the concepts of central limit theorem and point estimation	K3

Mapping with Programme Outcomes

COs \ POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	M	S	S	L	S
CO3	S	S	S	S	S
CO4	M	S	M	S	S
CO5	S	M	S	M	M

S – Strong; M – Medium; L – Low

Syllabus

UNIT I (21 hrs.)

Discrete Distributions : Random Variables of the Discrete Type – Mathematical Expectations – Special Mathematical Expectation – The Binomial Distribution – *The Negative Binomial Distribution* – The Poisson Distribution.

UNIT II (21 hrs.)

Continuous Distributions : Random Variables of the Continuous Type – The Exponential, Gamma and χ^2 Distributions – *The Normal Distribution*.

UNIT III (21 hrs.)

Bivariate Distributions: Bivariate Distributions of the Discrete Type – The Correlation Coefficient- *Conditional Distributions* – Bivariate Distributions of the Continuous Type – The Bivariate Normal Distributions.

UNIT IV (21 hrs.)

Distributions of Functions of Random Variables: Functions of One Random Variable – Transformations of Two Random Variables – Several Random Variables – *The Moment -Generating Function Technique*.

UNIT V (21 hrs.)

Distributions of Functions of Random Variables: Random Functions Associated with Normal Distributions – The Central Limit Theorem – Approximations for Discrete Distributions – Chebyshev's Inequality and Convergence in Probability – *Limiting Moment-Generating Functions*.

Point Estimation : Descriptive Statistics – Maximum Likelihood Estimation.

Note: Italic denotes Self Study Topics.

Text Book

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Robert V.Hogg, Elliot A.Tanis, Dale L.Zimmerman	Probability and Statistical Inference	Pearson Education Inc.	2015, 9 th Edition.
	Unit I	:	Chapter 2 – Sections 2.1 to 2.6	
	Unit II	:	Chapter 3 – Sections 3.1 to 3.3	
	Unit III	:	Chapter 4 – Sections 4.1 to 4.5	
	Unit IV	:	Chapter 5 – Sections 5.1 to 5.4	
	Unit V	:	Chapter 5 – Sections 5.5 to 5.9 Chapter 6 – Section 6.1 & 6.4	

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Presanna Sahoo	Probability and Mathematical Statistics	University of Louisville, USA	2013
2.	Barbara Illowsky, Susan Dean	Introductory Statistics	Openstax Rice University, Texas	2014
3.	Robert V.Hogg, Joseph W.Mckean, Allen T.Crag	Introduction to Mathematical Statistics	Pearson	2018, 8 th Edition.
4.	S.C. Gupta & V.K.Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons	2014

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar

- Question paper setters are asked to confine to the above **text book** only

CODE	COURSE TITLE
18MCUC204	TRIGONOMETRY AND VECTOR ANALYSIS

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	72	3	--	4

Preamble

To explore the solution of problems from a mathematical perspective and fundamental concepts of trigonometry and vector analysis. To prepare students to succeed in upper level math, science, engineering and other courses that require trigonometry and vector analysis.

Prerequisites

- Students must know the basics of trigonometric identities and complex number system
- Essential knowledge in scalars and vectors

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Learn to use trigonometric function to solve the problems and understand the concept of logarithmic form of a complex number	K1
CO2	apply the ideas of tangent, normal vectors and to study the motion of an object along a space curve	K2
CO3	find the rate of change of a function of two or more variables in any direction	K2
CO4	Interpret the concepts of gradient, divergence and curl	K2
CO5	Understand the concept of the line, surface and volume integrals	K3

Mapping with Programme Outcomes

COs \ POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	L	M	M
CO2	S	S	S	S	S
CO3	M	S	M	S	S
CO4	S	S	S	S	S
CO5	M	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(15 hrs.)

Expansions and Logarithm of a Complex Number: Expansion of $\cos n\varphi$, $\sin n\varphi$, $\cos^n\varphi$, $\sin^n\varphi$ – **Hyperbolic functions** – Separation of real and imaginary parts of $\sin(\alpha + i\beta)$, $\cos(\alpha + i\beta)$, $\tan(\alpha + i\beta)$, $\sinh(\alpha + i\beta)$, $\cosh(\alpha + i\beta)$, $\tanh(\alpha + i\beta)$, $\tan^{-1}(\alpha + i\beta)$ - Logarithm of a Complex Number.

UNIT II

(15 hrs.)

Vectors and the Geometry of Space : Three-Dimensional Coordinate Systems – Vectors – The Dot Product – The Cross Product – Equations of Lines and Planes – Cylinders and Quadric Surfaces – **Vector Functions:** Vector Functions and Space Curves – Derivatives and Integrals of Vector Functions – *Arc Length and Curvature* – Motion in Space: Velocity and Acceleration

UNIT III

(15 hrs.)

Partial Derivatives: Functions of Several Variables – Limits and Continuity – Partial Derivatives – Tangent Planes and Linear Approximations – *The Chain Rule* – Directional Derivatives and the Gradient Vector – Maximum and Minimum Values – Lagrange Multipliers

UNIT IV

(15 hrs.)

Differentiation of Scalar and Vector Point Functions: Scalar and Vector functions - Level Surfaces - Directional derivative of a Scalar Point Function - Gradient of a Scalar Point Function - Summation notation for Gradient - Gradient of $f(r)$ - Divergence and Curl of a Vector Point Function - Summation notation for Divergence and Curl - Laplacian Differential Operator - Other Differential Operators - Divergence and Curl of a Gradient - *Divergence and Curl of a Curl* - Examples.

UNIT V

(15 Hrs.)

Integration of Point Functions: Line Integrals - Independence of Path of Integration - Conservative Field and Scalar Potential - *Line Integral of a Conservative Vector* - Surface Integrals - Volume Integrals - Cylindrical and Spherical Polar Coordinates - Examples.

Note: *Italics denote Self Study Topics*

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	S. Narayanan and T.K.Manicavachagom Pillay	Trigonometry	S.Viswanathan Printers and Publishers Pvt.Ltd., Chennai	2015
		Unit I : Chapter 3	Sec. 1 & Sec. 4	
		Chapter 4	Sec. 1 & Sec. 2	
		Chapter 5	Sec. 5	
2.	James Stewart	Calculus: Early Transcendentals (Units II, III)	Thomson Brooks/Cole, USA	2016, 8 th Edition
		Unit II : Chapter 12	Sec. 12.1 - 12.6	
		Chapter 13	Sec. 13.1 - 13.4	
		Unit III : Chapter 14	Sec. 14.1 - 14.8	
3.	P. Duraipandian & Kayalal Pachaiaappa	Vector Analysis (Units IV, V)	S.Chand & Company PVT.Ltd	2014, 1 st Edition
		Unit IV : Chapter 2	Sec. 2.1 - 2.13	
		Unit V : Chapter 3	Sec. 3.1 - 3.8	

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Robert E Moyer, Frank Ayres JR	Schaum's Outlines Trigonometry	Tata McGraw Hill Publishing Company, New Delhi	2013, 5 th Edition
2.	M.D.Raisinghania, H.C.Saxena, H.K.Dass	Trigonometry	S.Chand & Sons, New Delhi	2002

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar

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CODE	COURSE TITLE
18MCUA202	MATHEMATICAL STATISTICS - II

Category	CIA	ESE	L	T	P	Credit
Allied - I	25	75	100	5	-	5

Preamble

To gain the knowledge about estimators, confidence intervals and testing of statistical hypothesis.

Prerequisite

- Knowledge of random variables and distributions

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the ideas of point estimation	K1
CO2	Classify the tools of interval estimation	K2
CO3	Demonstrate the concepts of test of statistical hypothesis	K2
CO4	Apply the ideas of parametric test and contingency table	K3
CO5	Develop the methods of variance	K3

Mapping with Programme Outcomes

COs \ POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	S	M	S	S
CO3	M	M	S	S	S
CO4	S	S	S	M	S
CO5	M	S	M	S	L

S – Strong; M – Medium; L – Low

Syllabus

UNIT I (21 hrs.)

Point Estimation: *A Simple Regression Problem* – Asymptotic Distributions of Maximum Likelihood Estimators – Sufficient Statistics – Bayesian Estimation.

UNIT II (21 hrs.)

Interval Estimation : Confidence Intervals for Means – Confidence Intervals for the Difference of Two Means – Confidence Intervals of Proportions – *Sample Size*.

UNIT III (21 hrs.)

Tests of Statistical Hypothesis : Tests about One Mean – Tests of the Equality of Two Means – Tests about Proportions – *Power of a Statistical Test* – Best Critical Regions.

UNIT IV (21 hrs.)

More Tests : Chi-Square Goodness-of-Fit Tests – *Contingency Tables* – One - Factor Analysis of Variance.

UNIT V (21 hrs.)

More Tests: *Two - Way Analysis of Variance* – General Factorial and 2^k Factorial Designs – Tests Concerning Regression and Correlation.

Note: Italic denotes Self Study Topics.

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1.	Robert V.Hogg, Elliot A.Tanis, Dale L.Zimmerman	Probability and Statistical Inference	Pearson Education Inc.	2015, 9 th Edition.
Unit I	:	Chapter 6 – Sections 6.5 to 6.8		
Unit II	:	Chapter 7 – Sections 7.1 to 7.4		
Unit III	:	Chapter 8 – Sections 8.1 to 8.3, 8.5 & 8.6		
Unit IV	:	Chapter 9 – Sections 9.1 to 9.3		
Unit V	:	Chapter 9 – Sections 9.4 to 9.6		

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2.	Barbara Illowsky, Susan Dean	Introductory Statistics	Openstax Rice University, Texas	2014

3.	Robert V.Hogg, Joseph W.Mckean, Allen T.Crag	Introduction to Mathematical Statistics	Pearson	2018, 8 th Edition.
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