



Semester: III						
LINEAR ALGEBRA AND PROBABILITY THEORY						
(Theory)						
(CD, CS, CY, IS)						
Course Code	:	MAT231CT		CIE	:	100 Marks
Credits: L: T: P	:	3:1:0		SEE	:	100 Marks
Total Hours	:	45L+30T		SEE Duration	:	3.00 Hours

Unit-I		09 Hrs
<b>Linear Algebra – I:</b> Vector spaces, subspaces, linear dependence and independence, basis, dimension, four fundamental subspaces, rank-nullity theorem. Linear transformations - matrix representation, kernel and image of a linear transformation, dilation, reflection, projection, and rotation matrices. Implementation using MATLAB.		
Unit – II		09 Hrs
<b>Linear Algebra - II:</b> Inner Products, orthogonal matrices, orthogonal and orthonormal bases, Gram-Schmidt process, QR-factorization. Eigen values and Eigen vectors (recapitulation), diagonalization of a matrix (symmetric matrices) and singular value decomposition. Implementation using MATLAB.		
Unit –III		09 Hrs
<b>Random Variables:</b> Random variables-discrete and continuous, probability mass function, probability density function, cumulative distribution function, mean and variance. Two or more random variables - Joint probability mass function, joint probability density function, conditional distribution and independence, Covariance and Correlation.		
Unit –IV		09 Hrs
<b>Probability Distributions and Sampling Theory:</b> Discrete and continuous distributions - Binomial, Poisson, Exponential and Normal. Sampling theory - Sampling, sampling distributions - Simple random sampling (with replacement and without replacement). Standard error, Sampling distributions of means ( $\sigma$ known), Sampling distributions of proportions, Sampling distribution of differences and sums. Implementation using MATLAB.		
Unit –V		09 Hrs
<b>Inferential Statistics:</b> Principles of Statistical Inference, Test of hypothesis - Null and alternative hypothesis, Procedure for statistical testing, Type I and Type II errors, level of significance, Tests involving the normal distribution, one –tailed and two –tailed tests, P – value, Special tests of significance for large and small samples (F, Chi – square, Z, t – test). Implementation using MATLAB.		

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of linear algebra, random variables, distributions, sampling and inferential statistics.
CO2:	Compute the solution by applying the acquired knowledge of linear algebra, random variables, distributions, sampling and inferential statistics to the problems of engineering applications.
CO3:	Analyze the solution of the problems obtained from appropriate linear algebra and probability techniques to the real-world problems arising in many practical situations.
CO4:	Interpret the overall knowledge of linear algebra, random variables, probability distributions, sampling theory and inferential statistics gained to engage in life – long learning.



Reference Books	
1	Linear Algebra and its Applications, David C. Lay, 3 <sup>rd</sup> Edition, 2002, Pearson Education India, ISBN-13: 978-81-7758-333-5.
2	Linear Algebra with Applications, Steven J. Leon, 9 <sup>th</sup> Edition, 2014, Pearson, ISBN: 13:978-0321962218.
3	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9 <sup>th</sup> edition, 2016, Pearson Education, ISBN-13: 978-0134115856.
4	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 6 <sup>th</sup> Edition, John Wiley & Sons, 2014, ISBN:13 9781118539712, ISBN (BRV):9781118645062.
5	Higher Engineering Mathematics, B.V. Ramana, 11 <sup>th</sup> Edition, 2010, Tata McGraw-Hill, ISBN: 13-978-07-063419-0; ISBN: 10-0-07-063419-X.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	COMPONENTS	MARKS
1.	<b>QUIZZES:</b> Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. <b>THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.</b>	20
2.	<b>TESTS:</b> Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 150 Marks. <b>FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.</b>	40
3.	<b>EXPERIENTIAL LEARNING:</b> Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (05), Program specific requirements (05), Video based seminar/presentation/demonstration (10), MATLAB (20). <b>ADDING UPTO 40 MARKS.</b>	40
<b>MAXIMUM MARKS FOR THE CIE THEORY</b>		<b>100</b>

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	CONTENTS	MARKS
<b>PART A</b>		
1	Objective type questions covering entire syllabus	20
<b>PART B</b> (Maximum of TWO Sub-divisions only)		
2	Unit 1: (Compulsory)	16
3 & 4	Unit 2: Question 3 or 4	16
5 & 6	Unit 3: Question 5 or 6	16
7 & 8	Unit 4: Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
<b>TOTAL</b>		<b>100</b>