



Semester: III					
LINEAR ALGEBRA AND PROBABILITY THEORY					
Category: PROFESSIONAL CORE COURSE					
(Theory)					
(Common to CD, CS, CY, IS)					
Course Code	:	MAT231TC		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
Linear Algebra – I: 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
Linear Algebra - II: 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
Random Variables: 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. Implementation using MATLAB.	
Unit –IV	09 Hrs
Probability Distributions and Sampling Theory: 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 (σ known), sampling distributions of proportions, sampling distribution of differences and sums. Implementation using MATLAB.	
Unit –V	09 Hrs
Inferential Statistics: 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 rd Edition, 2002, Pearson Education India, ISBN-13: 978-81-7758-333-5.
2	Linear Algebra with Applications, Steven J. Leon, 9 th Edition, 2014, Pearson, ISBN: 13:978-0321962218.
3	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9 th Edition, 2016, Pearson Education, ISBN-13: 978-0134115856.
4	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 6 th Edition, 2014, John Wiley & Sons, ISBN:13 9781118539712, ISBN (BRV):9781118645062.
5	Higher Engineering Mathematics, B.V. Ramana, 11 th 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.	QUIZZES: Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.	20
2.	TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.	40
3.	EXPERIENTIAL LEARNING: 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). ADDING UPTO 40 MARKS.	40
MAXIMUM MARKS FOR THE CIE THEORY		100
RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	CONTENTS	MARKS
PART A		
1	Objective type questions covering entire syllabus	20
PART 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
TOTAL		100