

Kadi Sarva Vishwavidyalaya
Faculty of Engineering and Technology
First Year Master of Engineering (Computer Engineering)
In Effect from Academic Year 2017-18

Subject Code: MECE105-N	Subject Title: APPLIED MATHEMATICS
--------------------------------	---

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
03	01	00	04	04	03	70	30	20	00	120

LEARNING OBJECTIVES:

The objective of this course is to introduce students to the following concepts.

- To introduce the fundamentals of probability theory and random processes and illustrate these concepts with engineering applications. This course will present the basic principles of random variables and random processes needed in applications such as signal processing, digital communications, speech processing, data modeling, etc. R will be used as a software tool for bringing probability theory and real-world applications closer together.
- To understand several important concepts in linear algebra, including systems of linear equations and their solutions; matrices and their properties; determinants and their properties; vector spaces; linear independence of vectors; subspaces, bases, and dimension of vector spaces; inner product spaces; linear transformations; and eigenvalues and eigenvectors;
- To apply these concepts to such real world phenomena as electrical networks, traffic flow, archeological dating, economic interdependencies, population movement, communication networks, and weather prediction;
- To improve the ability (or to learn!) to prove mathematical theorems;
- To improve the ability to think logically, analytically, and abstractly; and
- To improve the ability to communicate mathematics, both orally and in writing

OUTLINE OF THE COURSE:

Sr. No	Title of the Unit	Hours
1	Combinatorial Analysis	3
2	Probability Axioms and Conditional Probability	6
3	Random Variables	8
4	Exploring Data	2
5	Correlation and Regression	2
6	Sampling Distributions & Confidence Intervals	3
7	Significance Tests	2
8	Estimation Theory	2
9	Introduction to Vector Space and Sub space	9
10	Eigen value and Eigen vector	7
11	Linear Transformation	4

Total hours (Theory): 48

Total hours: 48

DETAILED SYLLABUS:

Kadi Sarva Vishwavidyalaya
Faculty of Engineering and Technology
First Year Master of Engineering (Computer Engineering)
In Effect from Academic Year 2017-18

Sr. No	Topic	Lecture Hours	Weight age(%)
1	Combinatorial Analysis <ul style="list-style-type: none"> • The Basic Principal of Counting • Permutation and Combination • Multinomial Coefficients 	3	6
2	Probability <ul style="list-style-type: none"> • Sample Space and Events • Axioms of Probability • Conditional Probability • Bayes Theorem 	6	13
3	Random Variable <ul style="list-style-type: none"> • Discrete Random Variable • Expectation of a Function of Random Variable • Bernoulli/Binomial/poison Distribution • Continuous Random Variable • Expectation and Variance of Continuous Random Variable • The Uniform Random Variable • Normal Random Variable • Exponential Random Variable • The Gamma/Cauchy/Beta Distribution • Jointly Distributed Random Variable 	8	17
4	Exploring Data : Data Visualization <ul style="list-style-type: none"> • Cases, variables and levels of measurement • Data matrix and frequency table • Graphs and shapes of distributions • Mode, median and mean • Range, interquartile range and box plot • Variance and standard deviation • Z-scores 	2	4
5	Correlation and Regression <ul style="list-style-type: none"> • Crosstabs and scatterplots • correlation • Linear Regression and logistic Regression • Contingency Table • 	2	4

Kadi Sarva Vishwavidyalaya
Faculty of Engineering and Technology
First Year Master of Engineering (Computer Engineering)
In Effect from Academic Year 2017-18

6	Sampling Distributions & Confidence Intervals <ul style="list-style-type: none"> • Sample and population and sampling distribution • The central limit theorem • Statistical inference • CI for mean with known population standard deviation • CI for mean with unknown population standard deviation • CI for proportion • Confidence levels 	3	6
7	Significance Tests <ul style="list-style-type: none"> • Hypotheses and Test about proportion • Significance test about mean • Significance test and confidence interval • Type I and type II errors 	2	4
8	Estimation Theory <ul style="list-style-type: none"> • Unbiased Estimators • Method of Moments • Maximum Likelihood Estimation 	2	4
9	Vector Spaces and Subspaces <ul style="list-style-type: none"> • Vector and Linear combination • Length and vector Dot products • Spaces of Vectors • The Nullspace of A: Solving $Ax = 0$ • The Rank and the Row Reduced Form • The Complete Solution to $Ax = b$ • Independence, Basis and Dimension • Dimensions of the Four Subspaces • Orthogonal vector 	9	19
10	Eigenvalues and Eigenvectors <ul style="list-style-type: none"> • Introduction to Eigenvalues • Diagonalizing a Matrix • Applications to Differential Equations • Symmetric Matrices • Positive Definite Matrices • Similar Matrices • Singular Value Decomposition (SVD) 	7	15
11	Linear Transformation <ul style="list-style-type: none"> • The Idea of a Linear Transformation • The Matrix of a Linear Transformation • Diagonalization and the Pseudoinverse 	4	8
Total		48	100

INSTRUCTIONAL METHOD AND PEDAGOGY: (Continuous Internal Assessment (CIA) Scheme)

Kadi Sarva Vishwavidyalaya
Faculty of Engineering and Technology
First Year Master of Engineering (Computer Engineering)
In Effect from Academic Year 2017-18

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation

LEARNING OUTCOME:

On successful completion of the course, the student will be able to:

- Demonstrate an understand the basic principles of probability, conditional probability, independence,
- Bayes rule, discrete distributions, continuous distributions, etc.
- Basic knowledge about statistics
- understand the concept and basic structure of vector spaces, give examples and nonexamples, explain the concept of dimension, apply the dimension theorem (for the sum of two subspaces);
- elucidate the nullspace, row space and column space of a matrix, apply the rank-nullity theorem;

Text Book:

1. A First Course in Probability, Sheldon Ross, Fifth Edition
2. Introduction to Linear Algebra, Gilbert Strang, Fourth Edition

References:

1. Linear Algebra Done Right, Sheldon Axler
2. Linear Algebra, Kenneth Hoffman
3. Linear Algebra with Applications, Steven J Leon
4. Vector Calculus, 5th edition, Jerrold E. Marsden, Anthony Tromb