

**MATHEMATICAL FOUNDATIONS FOR AI & ML (Minors)****Course Objectives:**

At the end of semester, the students able to understand the concepts of:

1. The purpose of this course is to provide a mathematically rigorous introduction to these developments with emphasis on methods and their analysis.

**Course Outcomes:**

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

	COURSE OUTCOMES	BT
CO1	Determine whether or not particular subsets of a vector spaces are linearly independent.	1, 2, 3
CO2	Understand inner products and associated norms.	1, 2, 3
CO3	Understand the concepts of probability distributions.	1, 2, 3
CO4	Explain sampling distribution, estimation and confidence intervals.	1, 2, 3, 4
CO5	Understand how to find nature as well as the amount of relationship between the human variables.	1, 2, 3, 4, 5

**CO – PO Mapping**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	-	-	-	-	-	-	-	-	-	1
2	2	2	-	-	-	-	-	-	-	-	-	1
3	2	2	-	-	-	-	-	-	-	-	-	1
4	2	2	-	-	-	-	-	-	-	-	-	1
5	2	2	-	-	-	-	-	-	-	-	-	1

**CO –PSO Mapping**

	CSE		
CO	PSO1	PSO2	PSO3
1	2	-	-
2	2	-	-
3	2	-	-
4	2	-	-
5	2	-	-

### **UNIT- I**

Linear Algebra: Vector Spaces, Linear Independence, Basis and Rank, Linear Mappings - affine spaces

### **UNIT-II**

Analytic Geometry: Norms, Inner Products, Lengths and Distances, Angles and Orthogonality, Orthonormal Basis, Orthogonal Complement, Inner Product of Functions, Orthogonal Projections.

### **UNIT-III**

Probability and Distributions: Construction of a Probability space, Discrete and Continuous probabilities, sum rule, product rule and Bayes Theorem, Summary statistics and Independence, Gaussian Distribution.

### **UNIT-IV**

Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t,  $\chi^2$  and F-distributions – Point and Interval estimations – Standard error and Maximum error of estimate.

### **UNIT-V**

Method of least squares – Straight line – Parabola – Exponential – Power curves. Regression - Regression coefficients and properties – Curvilinear Regression, Multiple Regression - Correlation – correlation coefficient – Rank correlation

#### **Text Books:**

1. <https://mml-book.github.io/book/mml-book.pdf> - c 2021 M. P. Deisenroth, A. A. Faisal, C. S. Ong. Published by Cambridge University Press (2020).
2. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.

#### **Reference Books:**

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
2. Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.
5. Probability, Statistics and Random Processes, Murugesan, Anuradha Publishers, Chennai.

#### **Web Links:**

1. [https://onlinecourses.nptel.ac.in/noc17\\_ma17/preview](https://onlinecourses.nptel.ac.in/noc17_ma17/preview)
2. [https://onlinecourses.nptel.ac.in/noc16\\_ma03/preview](https://onlinecourses.nptel.ac.in/noc16_ma03/preview)
3. <https://www.youtube.com/watch?v=1VSZtNYMntM>