Mathematical Methods
for Computing

Code	Credit Hours
CS- 813	3+0

Course Description

This course is designed to teach to the core mathematical concepts in details that will later help these graduate students for their research. This course includes some topics from advanced linear algebra that are used in engineering and research applications.

This course also discusses the concepts related to probability and statistics which play an important role in machine learning, pattern recognition and various fields of data sciences.

Text Book:

1. Linear Algebra and Its Applications 4th Edition, David C. Lay

2. Mathematics for Machine Learning, Deisenroth et al, 2019

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Project	10%
Mid Terms	30%
ESE	50%

Teaching Plan

Week 1	Solving linear equations. Linear independence.
Week 2	Rank and subsapces
Week 3	Norms; inner products; lengths
Week 4	Orthonormal basis; projections
Week 5	Eigenvalues, eigenvectors, and spectral decomposition
Week 6	Singular value decomposition and matrix factorization in general
Week 7	Random variables; Baye's theorem
Week 8	Poisson and Gaussian distributions
Week 9	Mid-Semester Break
Week 10	Multivariate distributions and maximum likelihood method
Week 11	Gradient descent
Week 12	Empirical risk management
Week 13	Linear regression
Week 14	Dimensionality reduction
Week 15	Gaussian mixture model
Week 16	Some advanced topics
Week 17	Revision
Week 18	End Semester Break