

**Department of Electrical Engineering
I.I.T.Delhi**

Title of the Course: Mathematical Foundations for Computer Technology.

Course Number: ELL 780.

Credits: 3-0-0.

Pre Requisites: Calculus, Elementary Probability Theory, Introductory Matrix Theory

Course Content:

- Introduction to Metric Spaces, Vector Spaces, Normed Linear Spaces and Inner Product Spaces.
- Linear Transformation, Matrix of a Linear Transformation, System of Linear Equations, Eigenvalues and Eigenvectors, Diagonalization, Singular Value Decomposition (SVD), Quadratic Forms, Linear Equations and Least Squares, Pseudo Inverse.
- Convex Functions, Convex Optimization, Karush-Kuhn Tucker Optimality Conditions, Duality in Linear and Quadratic Programming, Algorithms for Unconstrained and Constrained Optimization Problems, Introduction to Interior Point Methods.
- Stochastic Processes, Markov Chain and Markov Process, Poisson Process, Monte-Carlo Simulation, Stochastic Calculus.

Reference Books:

- E. Kreyszig, Introductory Functional Analysis with Applications, Wiley (1978).
- G. C. Calafiore and Laurent El. Ghaoui, Optimization Models, Cambridge University Press (2014).
- G. H. Golub and C. F. Van-Loan, Matrix Computations, John Hopkins Studies in Computational Science, 4th edition, (2013).
- Sheldon M. Ross, Stochastic Processes, Wiley (1996).

Suggested Readings (for Optimization and Stochastic Processes):

- Liliana B. Castareda, V. Arunachalam. S. Dharmaraja, Introduction to Probability and Stochastic Processes with applications, Wiley (2012).
- S. Chandra, Jayadeva and Aparna Mehra, Numerical optimizations with Applications, Narosa, 4th reprint (2014).