

DEPARTMENT OF MATHEMATICS
INDIAN INSTITUTE OF TECHNOLOGY DELHI
MTL101 (LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS) CREDITS 4 (3-1-0)
SECOND SEMESTER 2018-2019

Course Contents

Vector spaces over \mathbb{Q} , \mathbb{R} and \mathbb{C} , subspaces, linear independence, linear span of a set of vectors, basis and dimension of a vector space, sum and direct sum.

Systems of linear (homogeneous and non-homogeneous) equations, matrices and Gauss elimination, elementary row operations, row space, column space, null space and rank of a matrix. Linear transformation, rank-nullity theorem and its applications, matrix representation of a linear transformation, change of basis and similarity.

Eigenvalues and eigenvectors, characteristic and minimal polynomials, Cayley-Hamilton theorem (without proof) and applications.

Review of first order differential equations, Picards theorem, linear dependence and Wronskian. Dimensionality of space of solutions, linear ODE with constant coefficients of second and higher order, Cauchy-Euler equations, Method of undetermined coefficients and method of variation of parameters. Boundary Value Problems: SturmLiouville eigenvalue problems. System of linear differential equations with constant coefficients, fundamental matrix, matrix methods.

Power Series and its convergence, power series method, Fourier series, Laplace Transform Method.

References

1. **K. Hoffman and R. Kunze**, *Linear Algebra* (2e), Printice Hall of India, 1990.
(1.1, 2.1-2.4, 1.2-1.4, 2.5-2.6, 8.1-8.2, 3.1,3.3,3.4)
2. **E. Kreyszig**, *Advanced Engineering Mathematics* (9e), Wiely Estern, 1998.
(7.3-7.5, 7.8; 8.1, 8.3-8.5)
(1.3-1.7; 2.1-2.3, 2.5-2.7, 2.10; 3.1-3.3; 4.0-4.2, 4.6; 5.1-5.8; 6.1-6.7; 11.1-11.4, 11.7-11.8)

Examinations *Two minors and one major tests, quiz(zes)*

Attendance *100% attendance is expected.*

Coordinator Prof. S Chandra Sekhara Rao

Other Instructors Prof. Amitabha Tripathi, Prof. Viswanathan Veedu and Prof. Punit Sharma

Course webpage <http://web.iitd.ac.in/~scsr/index.html>