

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2016-17
ME G535: Advanced Engineering Mathematics
Course Handout

August 1, 2016

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1 Course content

1. Matrix algebra

- (a) Linear vector spaces, bases, dimensionality, elementary properties such as determinant, trace etc.
- (b) Inner product, definiteness, orthogonality, normalization, norm
- (c) Eigenvalues, eigenvectors, semisimplicity, characteristic equation, rank
- (d) Change of basis, similarity transformation, invariants, diagonalization, Jordan canonical form, Cayley-Hamilton theorem

2. Mechanics of solids and fluids

- (a) Eulerian and Lagrangean approaches, tensor calculus, covariant and contravariant components of a tensor and its scalar invariants
- (b) Theory of deformation, stress, strain and strain rate tensors, compatibility equations, Riemann-Christoffel tensor, divergence theorems
- (c) Equations of continuity, linear momentum and angular momentum, laws of Hooke and Navier-Stokes, isotropy, anisotropy, gyrotropy, linear elastic body, linear viscous fluid, ideal fluid and gas.

3. Differential equations in Engineering

- (a) Homogeneous and non-homogeneous, constant and variable coefficient, second order linear ODEs
- (b) A system of linear constant and variable coefficient ODEs
- (c) Partial DEs - Wave equation, heat equation, Euler-Bernoulli beam equation, vibrating membranes
- (d) Engineering applications

2 Evaluation scheme

1. Assignments: 20%
2. Project: 20%
3. Mid-Sem Exam: 25%
4. End-Sem Exam: 35%

3 Examination Schedule

1. Mid-Sem Exam: 6/10 8:00 - 9:30 AM
2. End-Sem Exam: 8/12 AN

4 Text-book

1. Classroom notes.

5 Instructor

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