MATHEMATICS-II
(Common to all Branches)

Course Code:13BM1102

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Pre requisites:

- Basic formulae of differentiation and integrations.
- Basic terminology and elementary operations on Matrices.
- Basic concept of partial differentiation.

Course Educational Objectives:

- The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
- The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
- Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes:

Upon successful completion of the course, the students should be able to

- Solve simultaneous linear equations using matrix methods.
- Calculate eigenvalues and eigen vectors of matrices that are essential for vibration/design analysis.
- Understand Fourier series, integral ,transforms and they are provided with practice in their application and interpretation in a range of situations.
- Identify/classify and solve the different types of partial differential equations.

UNIT-I (12 Lectures)

MATRICES:

Rank, Normal form, Echelon form, Consistency and Solution of system of simultaneous linear homogeneous and non-homogeneous equations. Finding eigenvalues and eigen vectors, properties, Cayley-Hamilton theorem, computing inverse and powers of a matrix by applying Cayley-Hamilton theorem, Diagonalisation of matrix.
(2.7, 2.10, 2.13 -2.16)

UNIT-II (12 Lectures)

NUMERICAL METHODS IN LINEAR ALGEBRA:

Solution of linear simultaneous equations: LU decomposition, Jacobi iteration and Gauss-Seidel methods. Determination of eigenvalues and eigen vectors by iteration (Rayleigh's Power Method) .

(28.5, 28.6(3), 28.7(1)(2), 28.9)

UNIT-III (12 Lectures)

DIFFERENCE EQUATIONS AND APPLICATIONS:

Difference operators (forward, backward and shift operators), Introduction to difference equation, formation of difference equation, Linear difference equations and it's complete solution. Rules for finding the complementary function and complete integral, Deflection of a loaded string.
(29.1, 29.4, 31.1 - 31.6, 31.8)

UNIT-IV (12 Lectures)

FOURIER SERIES:

Euler's formulae, Dirichlet's Conditions for a Fourier expansion, functions having points of discontinuities, Change of interval, even and odd functions, half range series, wave forms.

FOURIER TRANSFORMS :

Fourier integral theorem, Fourier transform and inverse Fourier transform, Fourier sine and cosine integrals. – Fourier sine and cosine transforms – properties of Fourier Transforms – Finite Fourier transforms.
(10.1 – 10.9, 22.1 – 22.5)

UNIT-V (12 Lectures)

PARTIAL DIFFERENTIAL EQUATIONS:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear first order (standard type) equations.

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS:

Method of separation of variables, Classification of second order linear Partial Differential Equations. Solutions of one dimensional heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions. (17.1 – 17.3, 17.5, 17.6, 18.1-18.7)

TEXT BOOK:

Dr.B.S.Grewal *"Higher Engineering Mathematics"*, 42nd Edition, Khanna Publishers, 2012.

REFERENCES:

1. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
3. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th Edition, Cengage Learning, 2011.