Faculty of Science and Technology

R.T.M Nagpur University, Nagpur

Syllabus for B. E. Third Semester Mechanical Engineering

BEME301T Mathematics – III

Total Credits: 4
Teaching Scheme
Lectures/Tutorial: 3/1

Subject Code:
Examination Scheme
Theory T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam: 3 hours

Course Objectives:
1. A primary objective is to introduce and develop advanced mathematical skills of students that are imperative for effective understanding of engineering subjects.
2. The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enrich logical thinking power.

Course Outcomes:
After completing the course, students will be able to
1. Apply Laplace Transform to solve ordinary differential equations, Integral equations and Integro-differential Equations.
2. Apply Fourier series in the analysis of periodic functions in terms sine and cosine encountered in engineering problems and Fourier Transform to solve integral equations.
3. Learn the concept of differentiating, integrating and expanding of analytic functions in complex numbers and their applications such as evaluation of integrals of complex functions.
4. Solve partial differential equations of first order, higher order with constant coefficients and of second order using method of separation of variables.
5. Analyze real world scenarios to recognize when matrices are appropriate, formulate problems about the scenarios, creatively model these scenarios in order to solve the problems using multiple approaches.
6. Understand the impact of scientific and engineering solutions in a global and societal context.
7. Create the groundwork for post-graduate courses, specialized study, and research in mathematics.

Unit 1: LAPLACE TRANSFORM (10 Hrs)
Definition, Properties (Statement only), Evaluation of integrals by Laplace transform, Inverse Laplace transform using partial fraction method and properties of Laplace transform, Convolution theorem (Statement only), Laplace transform of periodic functions (Statement only), Unit step function and unit impulse function (Statement only), Applications of Laplace transform to solve ordinary differential equations, Integral equations & Integro-differential equations.

Unit 2: FOURIER SERIES & FOURIER TRANSFORM (10 Hrs)
Fourier Series: Periodic functions and their Fourier expansions, Even and odd functions, Change of interval, Half range expansions.
Fourier Transform: Definition and Properties (excluding FFT), Fourier integral theorem, Applications of Fourier transform to solve integral equations.

Unit 3: FUNCTIONS OF COMPLEX VARIABLES (10 Hrs)

Analytic function, Cauchy-Riemann conditions, Harmonic function (Excluding orthogonal system), Milne-Thomson method, Cauchy integral theorem & integral formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and singularities of analytic function, Residue theorem (Statement only).

Unit 4: PARTIAL DIFFERENTIAL EQUATIONS (10 Hrs)

Partial differential equations of first order first degree i.e. Lagrange's form, Linear homogeneous equations of higher order with constant coefficients, Method of separations of variables, Simple applications of Laplace transform to solve partial differential equations (One dimensional only).

Unit 5: MATRICES (8 Hrs)

Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largest eigen value and corresponding eigen vector by iteration method.

Text/Reference Books:

(1) Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.
(2) Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.
(3) Advanced Engineering Mathematics (S. Chand), H. K. Dass.
(4) Applied Mathematics for Engineers and Physicists, L. A. Pipes and L. R. Harville.
(5) Advanced Mathematics for Engineers, Chandrika Prasad.
(6) A text book of Engineering Mathematics (Laxmi Publication), N. P. Bali & M. Goyal.