

# Syllabus

## Semester-I

### MA1001E MATHEMATICS I

Pre-requisites: NIL

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**Total Lecture sessions: 39**

#### Course Outcomes:

- CO1: Formulate some engineering problems as ODEs and hence solve such problems.
- CO2: Solve linear ODEs with constant coefficients.
- CO3: Find the limits, check for continuity and differentiability of real valued functions of two variables
- CO4: Test for the convergence of sequences and series.
- CO5: Find the Fourier series representing periodic functions.

Existence and uniqueness of solution of first order ODE, methods of solutions of first order ODE, linear ODE, orthogonal trajectories, linear homogeneous second order ODEs with constant coefficients, fundamental system of solutions, existence and uniqueness of solutions, Wronskian, method of undetermined coefficients, solution by variation of parameters, Euler-Cauchy equations, applications of first and second order ODEs, system of linear ODEs with constant coefficients.

Function of several variables: Limit, continuity, partial derivatives, partial differentiation of composite functions, directional derivatives, gradient, local maxima and local minima of functions of two variables, critical point, saddle point, Taylor's formula for two variables, hessian, second derivative test, method of Lagrange multipliers. Parameterised curves in space, arc length, tangent and normal vectors, curvature and torsion.

Sequences, Cauchy sequence, convergence of sequences, series, convergence of series, tests for convergence, absolute convergence, sequence of functions, power series, radius of convergence, Taylor series, periodic functions and Fourier series expansions, half-range expansions, Fourier integral, Fourier transforms and their properties.

#### References:

1. Anton, I. Bivens and S. Davis, *Calculus*, 10th edition, New York: John Wiley & Sons, 2015.
2. G. B. Thomas, M.D. Weir and J. Hass, *Thomas' Calculus*, 12th edition, New Delhi, India: Pearson Education, 2015.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 10th edition, New York: John Wiley & Sons, 2015
4. Apostol, *Calculus Vol 1*, 1st ed. New Delhi: Wiley, 2014.