MA1012E MATHEMATICS II
(Common to CSE/EP branches)

Pre-requisites: Nil

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3	1	0	5	3

Total Lecture sessions: 39

Course Outcomes:

CO1: Acquire sufficient knowledge about convergence of sequences and series and various methods of testing for convergence.
CO2: Solve linear ODEs with constant coefficients.
CO3: Test the consistency of the system of linear equations and solve it.
CO4: Acquire sufficient knowledge about vector spaces, linear transformation and theory of matrices.
CO5: Diagonalise symmetric matrices and use it to find the nature of quadratic forms.

Numerical 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.

Existence and uniqueness of solution of first order ordinary differential equations (ODEs) - methods of solutions of first order ODE - linear ODE - linear homogeneous second order ODEs with constant coefficients - fundamental system of solutions - Wronskian - linear independence of solutions - method of undetermined coefficients - solution by variation of parameters.

System of linear equations: Gauss elimination method - row echelon form - row space - row rank - existence and uniqueness - homogeneous system - solution space - rank-nullity relation for homogeneous linear system. Abstract vector space - subspace - linear independence and span - basis - dimension - linear transformation - kernel - range - rank-nullity theorem.

Coordinates - matrix representation of linear transformation - base changing rule - eigenspace - diagonalisation of linear operator. Eigenvalues and eigenvectors of a matrix - Cayley-Hamilton theorem - diagonalisation of symmetric matrices - quadratic forms - transformation into principal axes - eigenvalue method of solving system of first order linear ODEs with constant coefficients.

References:

1. H. Anton, I. Bivens and S. Davis, *Calculus*, (10th edition) John Wiley & Sons, 2015.
2. Apostol, *Calculus Vol 1*, (1st edition) Wiley New Delhi, 2014.
3. E. Kreyszig, *Advanced Engineering Mathematics*, (10th edition) Wiley, 2015.
4. Gilbert Strang, *Differential Equations and Linear Algebra*, Cambridge Press, 2014.
5. Stephen W. Goode, Scott Annin, *Differential Equations and Linear Algebra* Pearson Prentice Hall, 2007.
6. O.Bretscher. *Linear algebra with applications*, New Delhi, Prentice Hall, 1997.