# B.A./B.Sc. II

## (From 2012-13 onwards)

### Paper I : LINEAR ALGEBRA and MATRICES M.M. : 33/65

**Linear Algebra**

**Unit 1.** Vector spaces and their elementary properties, Subspaces, Linear dependence and independence, Basis and dimension, Direct sum, Quotient space.

**Unit 2.** Linear transformations and their algebra, Range and null space, Rank and nullity, Matrix representation of linear transformations, Change of basis.

**Unit 3.** Linear functionals, Dual space, Bi-dual space, Natural isomorphism, Annihilators, Bilinear and quadratic forms, Inner product spaces, Cauchy-Schwarz's inequality, Bessel's inequality and orthogonality.

**Matrices**

**Unit 4.** Symmetric and skew-symmetric matrices, Hermitian and skew-Hermitian matrices, Orthogonal and unitary matrices, Triangular and diagonal matrices, Rank of a matrix, Elementary transformations, Echelon and normal forms, Inverse of a matrix by elementary transformations.

**Unit 5.** Characteristic equation, Eigen values and eigen vectors of a matrix, Cayley-Hamilton's theorem and its use in finding inverse of a matrix, Application of matrices to solve a system of linear (both homogeneous and non-homogeneous) equations, Consistency and general solution, Diagonalization of square matrices with distinct eigen values, Quadratic forms.

### Paper II : DIFFERENTIAL EQUATIONS and INTEGRAL TRANSFORMS

M.M. : 33/65

**Differential Equations**

**Unit 1.** Formation of a differential equation (D.E.), Degree, order and solution of a D.E., Equations of first order and first degree : Separation of variables method, Solution of homogeneous equations, linear equations and exact equations, Linear differential equations with constant coefficients, Homogeneous linear differential equations,

**Unit 2.** Differential equations of the first order but not of the first degree, Clairaut's equations and singular solutions, Orthogonal trajectories, Simultaneous linear differential equations with constant coefficients, Linear differential equations of the second order (including the method of variation of parameters),

**Unit 3.** Series solutions of second order differential equations, Legendre and Bessel functions ($P_n$ and $J_n$ only) and their properties.

Order, degree and formation of partial differential equations, Partial differential equations of the first order, Lagrange's equations, Charpit's general method, Linear partial differential equations with constant coefficients.

**Unit 4(*i*).** Partial differential equations of the second order, Monge's method.

**Integral Transforms**

**Unit 4(*ii*).** The concept of transform, Integral transforms and kernel, Linearity property of transforms, Laplace transform, Inverse Laplace transform, Convolution theorem, Applications of Laplace transform to solve ordinary differential equations.

**Unit 5.** Fourier transforms (finite and infinite), Fourier integral, Applications of Fourier transform to boundary value problems, Fourier series.

### Paper III : MECHANICS

**Dynamics** M.M. : 34/70

**Unit 1.** Velocity and acceleration along radial and transverse directions, and along tangential and normal directions, Simple harmonic motion, Motion under other laws of forces, Earth attraction, Elastic strings.

**Unit 2.** Motion in resisting medium, Constrained motion (circular and cycloidal only).

**Unit 3.** Motion on smooth and rough plane curves, Rocket motion, Central orbits and Kepler's law, Motion of a particle in three dimensions.

**Statics**

**Unit 4.** Common catenary, Centre of gravity, Stable and unstable equilibrium, Virtual work.

**Unit 5.** Forces in three dimensions, Poinsot's central axis, Wrenches, Null line and null plane.