UGC MODEL SYLLABUS

B.A./B.Sc. (HONOURS) PART-II : MATHEMATICS

BMH 201 (a & b) ADVANCED CALCULUS

(Duration : Two Semesters / One Year)

Continuity. Sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives. Taylor's theorem with various forms of remainders.

Limit and continuity of functions of two variables. Partial differentiation. Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables. Jacobians.

Envelopes. Evolutes. Maxima, minima and saddle points of functions of two variables. Lagrange's multiplier method. Indeterminate forms.

Beta and Gamma functions. Double and triple integrals. Dirichlet's integrals. Change of order of integration in double integrals.

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. Series of non-negative terms. Comparison tests. Cauchy's integral test. Ratio tests. Raabe's logarithmic, de Morgan and Bertrand's tests. Alternating series. Leibnitz's theorem. Absolute and conditional convergence.

BMH 202 (a & b) DIFFERENTIAL EQUATIONS

(Duration : Two Semesters / One Year)

Series solutions of differential equations. Power series method, Bessel, Legendre and Hypergeometric equations. Bessel, Legendre and Hypergeometric functions and their properties–convergence, recurrence and generating relations. Orthogonality of functions. Sturm-Liouville problem. Orthogonality of eigen-functions. Reality of eigenvalues. Orthogonality of Bessel functions and Legendre polynomials.

Laplace Transformation-Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms. Convolution theorem. Solution of integral equations and systems of differential equations using the Laplace transformation.

Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method of solution.

Partial differential equations of second and higher order Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equation with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's methods.

Calculus of Variations—Variational problems with fixed boundaries-Euler's equation for functionals containing first order derivative and one independent variable. Externals. Functionals dependent on higher order derivatives. Functionals dependent on more than one independent variable.

Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation.

Variational Problems with Moving Boundaries—Functionals dependent on one and two functions. One sided variations.

Sufficient conditions for an Extremum-Jacobi and Legendre conditions. Second Variation. Variational principle of least action.

BMH 203 (a & b) MECHANICS

(Duration : Two Semesters / One Year)

Statics

Analytical conditions of equilibrium of Coplanar forces. Virtual work. Catenary.

Forces in three dimensions. Poinsot's central axis. Wrenches. Null lines and planes. Stable and unstable equilibrium.

Dynamics

Velocities and accelerations along radial and transverse directions, and along tangential and normal directions. Simple harmonic motion. Elastic strings.

Motion on smooth and rough plane curves. Motion in a resisting medium. Motion of particles of varying mass.

Central Orbits. Kepler's laws of motion.

Motion of a particle in three dimensions. Acceleration in terms of different coordinate systems.