**Vector Calculus (10%):**  
Vector algebra; scalar and vector products of vectors; gradient divergence and curl of a vector; line, surface and volume integrals; Green’s, Stokes’ and Gauss theorems.  
**Statics (10%):**  
Composition and resolution of forces; parallel forces and couples; equilibrium of a system of coplanar forces; center of mass of a system of particles and rigid bodies; equilibrium of forces in three dimensions.  
**Dynamics (10%):**   
▪ Motion in a straight line with constant and variable acceleration; simple harmonic motion; conservative forces and principles of energy.   
▪ Tangential, normal, radial and transverse components of velocity and acceleration; motion under central forces; planetary orbits; Kepler laws;   
**Ordinary differential equations (20%):**   
▪ Equations of first order; separable equations, exact equations; first order linear equations; orthogonal trajectories; nonlinear equations reducible to linear equations, Bernoulli and Riccati equations.   
▪ Equations with constant coefficients; homogeneous and inhomogeneous equations; Cauchy Euler equations; variation of parameters. ▪ Ordinary and singular points of a differential equation; solution in series; Bessel and Legendre equations; properties of the Bessel functions and Legendre polynomials.  
**Fourier series and partial differential equations (20%):**   
▪ Trigonometric Fourier series; sine and cosine series; Bessel inequality; summation of infinite series; convergence of the Fourier series.   
▪ Partial differential equations of first order; classification of partial differential equations of second order; boundary value problems; solution by the method of separation of variables; problems associated with Laplace equation, wave equation and the heat equation in Cartesian coordinates.  
**Numerical Methods (30%):**   
▪ Solution of nonlinear equations by bisection, secant and Newton-Raphson methods; the fixed- point iterative method; order of convergence of a method.   
▪ Solution of a system of linear equations; diagonally dominant systems; the Jacobi and Gauss Seidel methods.   
▪ Numerical differentiation and integration; trapezoidal rule, Simpson’s rules, Gaussian integration formulas. ▪ Numerical solution of an ordinary differential equation; Euler and modified Euler methods; Runge-Kutta methods.

Applied Mathematics: