

SYLLABUS ON
VALUE-ADDED CERTIFICATE COURSE ON
Mathematical methods for Scientists and Engineers

Offered by



P.G. DEPARTMENT OF MATHEMATICS
UTKAL UNIVERSITY, BHUBANESWAR-751004

Course Title: Mathematical Methods For Scientists and engineers

Duration: 30 Hours

Number of students Participated: 40

Syllabus

Unit-I : Differential and Integral Calculus

Limits and differentiation, Derivative of functions, Derivative of composition of functions, Taylor's and Maclaurin's expansions; Asymptotes; Curvature; Curve tracing; Functions of several variables - partial differentiation; total differentiation; Euler's theorem and generalization; Change of variables - Jacobians; maxima and minima of functions of several variables (2 and 3 variables) - Lagrange's method of multipliers, Convergence of improper integrals; Beta and Gamma integrals; Differentiation under integral sign; Double and Triple integrals - computation of surface areas and volumes; change of variables in double and triple integrals.

Unit-II : Laplace Transform

Laplace transforms, Properties of Laplace transforms, existence of Laplace transforms, Linearity property of Laplace transform, The shifting theorem, Laplace transforms of unit step function, impulse function, periodic function, Convolution theorem, inverse Laplace transforms, Applications of Laplace transforms - solving certain initial value problems, solving system of linear differential equations, finding responses of systems to various inputs viz. sinusoidal inputs acting over a time interval, rectangular waves, impulses etc.

Unit-III : Vector Calculus

Scalar and vector fields; vector differentiation; level surfaces; directional derivative; gradient of a scalar field; divergence and curl of a vector field; Laplacian; Line and Surface integrals; Green's theorem in a plane; Stoke's theorem; Gauss Divergence theorem

Unit-IV : Numerical Integration and numerical solution of differential equations

Roots of polynomials, Bisection method, Regula-Falsi method, Secant method, Newton-Raphson method, Muller's method, Lagrange's interpolation, Least square approximation, Numerical integration, Trapezoidal rule and Simpson's 1/3rd rule, Euler's method, Runge-Kutta method of order 2 and 4, Shooting method.