ADVANCED CALCULUS

Common to ECE, CSE, IT, CSE(AI&ML) & CSE(DS) Branches

21MA201BS

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Course Objectives: To learn

1. Methods of solving the differential equations of First order and its applications
2. Methods of solving the differential equations of Higher order and its applications
3. Evaluation of multiple integrals and their applications
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surfaceand volume integrals

Course Outcomes: After learning the contents of this paper the student must be able to

CO 1: Identify whether the given differential equation of first order is exact or not

CO 2: Solve higher differential equation and apply the concept of differential equation to real world problems

CO 3: Evaluate the multiple integrals and apply the concept to find areas, volumes.

CO 4: Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order Ordinary Differential Equations

Exact, and Reducible to Exact linear and Bernoulli's Equations; Applications: OrthogonalTrajectories, Newton's law of cooling, Law of natural growth, decay and L-R Circuits.

UNIT-II: Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients. Non-Homogeneous termsof the type e^{ax}, sinax, cosax, polynomials in x, $e^{ax}V(x)$ and $xV(x)$; Method of variation of parameters; Equations reducible to linear ODE with constant coefficients; Legendre's equation,Cauchy-Euler equation, Applications to L-C-R Circuits.

UNIT-III: Multivariable Integral Calculus

Evaluation of Double Integrals: Cartesian and polar coordinates, change of order of integration in Cartesian form, Evaluation of Triple Integrals: Change of variables from Cartesian to Cylindrical and Spherical Coordinates.
Applications: Areas and volumes by double and triple integrals.

UNIT-IV: Vector Differentiation

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directionalderivatives, Tangent plane and normal line.Vector Identities (Without Proof). Scalar potential functions. Solenoidal and irrotational vectors.

UNIT-V: Vector Integration

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.

REFERENCES:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes.
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
3. Engineering Mathematics-I, by Dr. T.K.V Iyengar and others, S Chand and Co.
4. Integral Calculus by Shanthi Narayan