I Year B.Tech. IT – II Sem.

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Course Code: A52001

MATHEMATICS-II

(ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS)

Course Objectives: To learn

1. Methods of solving the differential equations of first and higher orders.
2. Evaluation of multiple integrals.
3. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course Outcomes: At the end of this course, students will be able to:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real world problems.
3. Evaluate the Double and Triple integrals.
4. Identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

UNIT-I:
Differential Equations of first order and their Applications

Formation of Differential equations, differential equations of first order and first degree: exact, linear and Bernoulli, applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT-II:
Higher Order Linear Differential Equations

Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X) $= e^{ax}$, $\sin ax$, $\cos ax$ *and* x^k, $e^{ax}V(x)$, $x^kV(x)$. Method of variation of parameters. Equations reducible to linear ODE with constant coefficients: Cauchy-Euler equation, Legendre's equation.

Multiple Integrals

Multiple integrals - double and triple integrals – change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Applications of Double integrals and Triple integrals.

UNIT-IV:
Vector Differentiation

Scalar and Vector point functions, Gradient, Divergence, Curl and their related properties – Directional Derivatives, Solenoidal and Irrotational vectors, Scalar potential function.

UNIT-V:
Vector Integration

Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements) - Problems based on these theorems.

TEXTBOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

REFERENCES:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. Dennis G Zill and Michael R Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 3rd Edition, 2006, Technology & Engineering.
4. S. L., Ross, Differential Equations, Wiley India, 3rd Edition, 2009.
5. George Simmons, Differential Equations with Applications and Historical Notes, McGraw Hill Education; 2nd Edition, 2017.