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| **B. TECH 1st SEMESTER** | **L** | **T** | **P** | **C** |
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| **16MA1T01: Differential Equations and Laplace Transforms** |

**Prerequisites**

Knowledge of differentiation, integration, logarithms, hyperbolic functions, and trigonometry is necessary**.** Concept of functions and their types, partial differentiation is also needed.

**COURSE OBJECTIVES**

1. The study of differential equations is introduced to make the students how to solve the problems in first order and first degree differential equations.
2. The study of second and higher order differential equations with constant coefficients.
3. To transform a given problem from one domain into another so that solving the corresponding problem becomes easier, Laplace transforms are introduced.
4. To know various physical and geometrical problems involving two or more independent variables, partial differential equations will be studied.

**COURSE OUTCOMES**

The students are able to

1. solve linear differential equations of all orders.
2. solve the first order partial differential equations.
3. apply the knowledge to find the expansions of functions using Taylors and Maclaurin’s series.
4. solve many problems in engineering with the knowledge of Laplace transforms.

**Syllabus:**

**UNIT -I Differential equations of first order and first degree**

Linear – Bernoulli – Exact - Reducible to exact - Newton’s Law of cooling-Law of natural growth and Decay - Orthogonal Trajectories.

**UNIT -II Linear differential equations of higher order**

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type eax, Sin ax, cos ax, polynomials in x, eaxV(x), xV(x).Method of Variation of parameters for solving second order linear differential equations.

**UNIT -III** **Partial Derivatives**

Taylor series and Maclaurin’s series expansions of functions of single and two variables (without Proofs) - Jacobian, Functional dependence.

**UNIT -IV Partial Differential Equations**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations-Solutions of Linear Partial differential equations with constant coefficients by the method of separation of Variables.

**UNIT -V Laplace transforms**

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac’s delta function.

**UNIT -VI Inverse Laplace transforms**

Inverse Laplace transforms -Convolution theorem (without proof).

Application: Solutions of ordinary differential equations using Laplace transforms.

**Books:**

1. **B.S. GREWAL**, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.
2. **B.V. RAMANA**, Higher Engineering Mathematics, Tata McGraw Hill.

**Reference Books:**

1. **ERWIN KREYSZIG**, Advanced Engineering Mathematics, 9th Edition, Wiley-India