2/4 B.Tech. THIRD SEMESTER
EE3T1   NUMERICAL METHODS AND DIFFERENTIAL EQUATIONS   Credits: 3
Lecture: 3 periods/week   Internal assessment: 30 marks
Tutorial: 1 period /week   Semester end examination: 70 marks

Course Objective:
To find approximate root of algebraic and transcendental equations and get familiarity with interpolation. To get knowledge in solving differentiation and integration problems using numerical methods. To acquire knowledge in basic concepts of partial differential equations and also some applications of partial differential equations

Course Outcomes: At the end of the course students will be able to
1. Determine approximate root of algebraic and transcendental equations and apply different methods to calculate value of interpolating polynomial at given point.
2. Evaluate integrals making use of quadrature   formulae, obtain derivative at given point of the interpolating polynomial.
3. Solve ordinary differential equations with given initial condition by Taylor's , Picard, Euler's, R.K. methods.
4. Solve first order linear and non-linear partial differential equations.
5. Apply method of separation of variables to find the solution of wave, heat, Laplace equations with given boundary conditions.

UNIT I
Solution of Algebraic and Transcendental Equations: Introduction – Bisection method – Method of false position – Iteration method – Newton-Raphson's method.

Interpolation: Introduction- Errors in polynomial interpolation – finite differences forward differences- backward differences – central differences – Symbolic relations –Differences of a polynomial - Newton's formulae for interpolation – Interpolation with unevenly spaced points- Lagrange's Interpolation formula.

UNIT II
Numerical Differentiation and Integration: Differentiation using finite differences - Trapezoidal rule – Simpson's 1/3 rule –Simpson's 3/8 rule-Boole's rule and weddle's rule

UNIT III
Numerical solution of Ordinary Differential equations: Solution by Taylor's series method - Picard's Method of successive approximations - Euler's Method - Runge-Kutta Methods– Predictor - Corrector Methods - Milne Thomsons's method.

UNIT IV
Partial Differential Equations: Formation of partial differential equations by elimination of arbitrary constants and by elimination of arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations.

UNIT V
Applications of Partial Differential equations: Solutions of linear partial differential equations with constant coefficients. Method of separation of variables, -one dimensional wave equation, one dimensional heat equation- Laplace equation

Learning Resources

Text Books:
1. A Textbook on Mathematical Methods, V. Ravindranath, P. Vijayalaxmi, Himalaya Publishing House-1st Revised Ed., 2011.
2. Higher Engineering Mathematics, B.S. Grewal- Khanna Publishers, 42nd Edition ,2012.

Reference Books:
1. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley, 8th Edition, 2006
2. A Text Book of Engineering Mathematics, B. V. Ramana, Tata McGraw Hill, 3rd Edition., 2008.