BE II-Semester syllabus for affiliated engineering colleges of Osmania University
(wef: academic year 2024-2025)
Common to all branches

DIFFERENTIAL EQUATIONS&NUMERICAL METHODS

BS203MT	DIFFERENTIAL EQUATIONS & NUMERICAL METHODS	3L:1T:0P	4 credits

Course objectives:

- To Develop strong problem-solving skills by tackling a variety of problems involving first-order differential equations
- To Develop strong problem-solving skills by tackling a variety of problems involving higher order differential equations
- To familiarizes concept of Laplace Transforms
- To Understand the Limitations and Applicability of Numerical Methods
- To Understand the Limitations and Applicability of Numerical Differentiation & Integration

Outcomes: After completing this course, the students will able to

- Students will enhance their problem-solving skills by applying the methods learned involving first-order differential equations.
- Students will enhance their problem-solving skills by applying the methods learned involving higher order differential equations.
- To learn Laplace transform and its properties
- Analyze and Interpret Interpolation
- Analyze and Interpret Numerical differentiation & integration

UNIT-I

Differential Equations of First Order: Exact differential equations, Integrating factors, Linear differential equations, Bernoulli's, Riccati's and Clairaut's differential equations, Orthogonal trajectories of a given family of curves.

UNIT-II

Differential Equations of Higher Orders: Solution of second and higher order linear homogeneous equations with constant coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients, Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation.

UNIT-III

Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof), Solution of ordinary differential equations using Laplace Transforms.

UNIT-IV

Numerical Methods-I: Solution of polynomial and transcendental equations- Bisection method, Iteration Method, Newton-Raphson Method and Regula-Falsi method. Finite differences-forward differences-backward differences-central differences-symbolic relations and separation of symbols, Interpolation using Newton's forward and backward formulae: Lagrange's method of interpolation.

UNIT-V

Numerical Methods-II: Numerical Integration: Trapezoidal rule and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules. Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.