

MUFFAKHAM JAH COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution)

Course Code	Course Title				Core/Elective	
25BS103MT	DIFFERENTIAL EQUATIONS & NUMERICAL METHODS (Common to CSE, CSE(AI), CSE(DS), CSE(AIML), ECE, CE, ME)				Core	
Pre-requisites	Contact hours per week			CIE	SEE	Credits
	L	T	P			
MDC	3	1	0	40	60	4

Course Objectives: To learn

1. Methods of solving the ordinary differential equations of first order.
2. Methods of solving the ordinary differential equations of second and higher order.
3. The physical quantities involved in engineering field related to vector valued functions.
4. Various numerical methods to find roots of polynomial and transcendental equations.
5. Evaluation of integrals using numerical techniques

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

1. Identify whether the given differential equation of first order is exact or not.
2. Solve the second and higher order ordinary differential equations.
3. Find the Gradient, Divergence, Curl and directional derivatives.
4. Find the root of a given polynomial and transcendental equations.
5. Estimate the value for the given data using interpolation

UNIT-I: Ordinary Differential Equations of First Order:

Exact differential equations, Equations reducible to exact differential equations, Integrating factors, Linear differential equations, Leibnitz's linear equation, Bernoulli's equation, and Clairaut's differential equations, Orthogonal trajectories of a given family of curves(Cartesian coordinates only).

UNIT-II: Ordinary Differential Equations of Higher Order: Solution of second and higher order linear homogeneous equations with constant coefficients, Solutions of non-homogeneous linear differential equations of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax}V(x)$, and $xV(x)$, Method of variation of parameters.

UNIT-III: Vector Differentiation:

Vector point functions and scalar point functions, Normal vector, Unit normal vector, Gradient, Divergence, Curl, Directional derivatives, Solenoidal and irrotational vectors.

UNIT-IV: Numerical Methods-I: Solution of polynomial and transcendental equations- Bisection method, Regula-Falsi method, and Newton-Raphson Method. Finite differences-forward differences-backward differences, 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 $1/3^{\text{rd}}$ rules. Ordinary differential equations: Taylor's series method; Euler's method; Modified Euler's method; Runge-Kutta method of fourth order.

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Kyp
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 Rps
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Suggested Reading:

1. R.K.Jain & S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 2014.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
3. N.P.Bali & Dr.Manish Goyal, A textbook of Engineering Mathematics(Volume I), 10th Edition, Laxmi Publications, 2022.
4. H.K.Dass and Er.Rajnish Verma, Higher Engineering Mathematics, S.Chand and Company Limited, New Delhi.

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