II Year I Semester	**L**	**T**	**P**	**C**
Code: 20MA3005	**3**	**0**	**0**	**3**

NUMERICAL TECHNIQUES and PARTIAL DIFFERENTIAL EQUATIONS

Learning Objectives:

1. The course is designed to equip the students with necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

	COURSE OUTCOMES	BT
CO1	Determine the numerical solution of the algebraic and transcendental equations.	1, 2, 3
CO2	Determine interpolation techniques for data analysis.	1, 2, 3
CO3	Determining the numerical solutions of the ordinary differential equations.	1, 2, 3
CO4	Develop the ability to form partial differential equations and solve the partial differential equations of first order.	1, 2, 3
CO5	Identify / Classify and Solve the Partial differential equations of second order and higher order.	1, 2, 3

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	-	3	-	-	-	-	2	-	-	1
2	2	2	-	2	-	-	-	-	2	-	-	1
3	2	3	-	-	-	-	-	-	-	-	-	1
4	2	2	-	1	-	-	-	-	-	-	-	1
5	1	2	-	1	-	-	-	-	-	-	-	1

CO –PSO Mapping

	CE			ME	
CO	**PSO1**	**PSO2**	**PSO3**	**PSO1**	**PSO2**
1	-	-	2	1	-
2	-	-	2	1	-
3	-	-	2	1	-
4	-	-	2	1	-
5	-	-	2	1	-

UNIT I: Iterative methods:
Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method

UNIT II: Interpolation:
Introduction– Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula

UNIT III: Numerical integration and solution of ordinary differential equations:
Trapezoidal rule – Simpson's 1/3rd and 3/8th rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

UNIT –IV: PDE of first order:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Linear PDE of higher order and its Applications:
Solutions of Homogeneous linear partial differential equations of higher order. Method of separation of variables, Classification of second order partial differential equations

Applications of PDE: Application of PDE to one-dimensional wave, heat and Two- dimensional Laplace's equation in cartesian coordinates.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books

1. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley India Edition.
2. Advanced Engineering Mathematics: Michael Greenberg, Pearson.

Web Link:
- https://nptel.ac.in/courses/111/107/111107105/
- https://nptel.ac.in/courses/111/103/111103021/