II Year - I Semester
20MA3004

L	T	P	C
3	0	0	3

NUMERICAL TECHNIQUES and PARTIAL DIFFERENTIAL EQUATIONS
(CE and ME)

Learning Objectives:

- The course is designed to equip the students with necessary mathematical skills and techniques that are essential for an engineering course.
- 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/