

**II B. Tech – I Semester**  
**(20MA1001) NUMERICAL TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

**Pre-Requisites:**

**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.

**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.

**Course Outcomes:**

After successful completion of the course, the students will be able to:

	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

**Correlation of COs with POs& PSOs:**

C O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
1	3	3	-	3	-	-	-	-	2	-	-	1	1	-
2	2	2	-	2	-	-	-	-	2	-	-	1	1	-
3	2	3	-	-	-	-	-	-	-	-	-	1	1	-
4	2	2	-	1	-	-	-	-	-	-	-	1	1	-
5	1	2	-	1	-	-	-	-	-	-	-	1	1	-

**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/>