20MA204T					Mathematics – III: Civil Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To provide a broad coverage of various mathematical techniques that are widely used for solving and to get analytical solutions to partial differential equations of first and second order.
- To introduce various applications of partial differential equations in many fields of science and engineering.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.

UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS OF FIRST ORDER **10 Hrs.**

Formation of Partial Differential Equations (PDEs), Solutions of PDEs of first order, Cauchy problem for first order PDEs, Lagrange's method, Charpit and Jacobi methods for solving first order nonlinear PDEs.

UNIT 2 PARTIAL DIFFERENTIAL EQUATIONS OF SECOND ORDER AND APPLICATIONS **10 Hrs.**

Classification of second order PDEs, Method of separation of variables, Fourier series solutions of one-dimensional wave equation, One dimensional equation of heat conduction, Steady state solution of two-dimensional equation of heat conduction.

UNIT 3 NUMERICAL SOLUTION OF SYSTEM OF LINEAR EQUATIONS & NON-LINEAR EQUATIONS **10 Hrs.**

Solution of transcendental and non-linear equations by Bisection, Regula-Falsi, Newton-Raphson and Secant method. Concept of Ill conditioned system. Solution of a system of linear simultaneous equations by LU Decomposition, Cholesky Decomposition, Jacobi and Gauss Seidel methods.

UNIT 4 INTERPOLATION AND APPROXIMATION **10 Hrs.**

Interpolation with unequal intervals – Lagrange's interpolation, Newton's divided difference interpolation, Cubic Splines, Difference operators and relations, Interpolation with equal intervals – Newton's forward and backward difference formulae.

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Identify real phenomena as models of partial differential equations.
CO2 – Understand the formation and solution of PDEs of first, second and higher order.
CO3 – Apply various analytic methods to obtain solutions to PDEs of first and second order, which occur in science and engineering.
CO4 – Solve algebraic and transcendental equations by various numerical methods.
CO5 – Use interpolation methods to estimate the missing data
CO6 – Analyze properties of interpolating polynomials and derive conclusions.

TEXT / REFERENCE BOOKS

1. K. S. Rao: Introduction to Partial Differential Equations, PHI Learning Pvt Ltd, New Delhi, 2010
2. T. Amaranth, An Elementary Course in Partial Differential Equations, Narosa Publishing House, New Delhi.
3. L.C. Evans, Partial Differential Equations, Graduate Studies in Mathematics, Vol. 19, American Mathematical Society, 1998
4. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 5thEd., New Age International, 2007.
5. S.S. Sastry, Introductory Methods for Numerical Analysis, 4th ed., Prentice Hall of India, 2009.
6. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, 3rd ed., Narosa, 2002.
7. B.S. Grewal, Numerical Methods in Engineering and Science with Programs in C & C++, Khanna Publishers, 2010.