20BSM207T					Partial Differential Equations					
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 familiarize students with the origin of partial differential equations and their types.
- To introduce Lagrange's method, Charpit's general method and Jacobi's method.
- To classify second order PDEs and understand their canonical forms.
- To solve physical phenomena modeled as PDEs.

UNIT 1 FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS **12 Hrs.**

Formation of partial differential equations, definition and examples of linear and non-linear partial differential equations, order and degree of partial differential equations, linear partial differential equation of first order, equation solvable by direct integration, Lagrange's method, integral surfaces passing through a given curve, surfaces orthogonal to a given system of surfaces, Charpit's general method, Jacobi's method.

UNIT 2 CLASSIFICATION AND CANONICAL FORMS **8 Hrs.**

Classification of second order PDE, Canonical forms, Canonical form for hyperbolic equation, Canonical form for parabolic equation, Canonical form for elliptic equation.

UNIT 3 SECOND ORDER PARTIAL DIFFERENTIAL EQUATIONS WITH CONSTANT AND VARIABLE COEFFICIENTS **8 Hrs.**

Homogeneous and nonhomogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficient, Second order PDE with variable coefficients

UNIT 4 APPLICATIONS **12 Hrs.**

Gravitational potential, Conservation laws and Burger's equations, Mathematical modeling of vibrating string, vibrating membrane, Derivation of Heat equation, Wave equation and Laplace equation, Method of separation of variables for second order PDE.

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 – Understand the formation and solution of PDEs of first, second and higher order.
CO2 – Classify and transform partial differential equations into canonical form.
CO3 – Solve first-order linear and nonlinear PDEs using Lagrange's, Charpit's and Jacobi's method.
CO4 – Apply a range of techniques to solve second order partial differential equations.
CO5 – Use partial differential equations to model physical phenomena.
CO6 – Solve some physical problems using a method of separation of variables.

TEXT/REFERENCE BOOKS

1. Myint-U, Tyn & Debnath, Lokenath, Linear Partial Differential Equation for Scientists and Engineers (4th ed.), 2007.
2. K. S. Rao: Introduction to Partial Differential Equations, PHI Learning Pvt Ltd, New Delhi, 2010
3. Sneddon, I. N. Elements of Partial Differential Equations, Dover Publications, 2006.
4. Stavroulakis, Ioannis P & Tersian, Stepan A. Partial Differential Equations: An Introduction with Mathematica and MAPLE, 2004.