Approval: 10th senate meeting

Course Name	: Partial Differential Equations
Course Number	: MA-522
Credit	: 3-1-0-4
Prerequisites	: NA
Students intended for	: M.Sc./M.S./Ph.D. /B.Tech. 3rd and 4th year
Elective or core	: Core for M.Sc. in applied Mathematics and Elective for other discipline.
Semester	: Odd/Even

Course Outline:

Introduction to PDE, First order PDEs, Solution methods for first order PDE. (5L)

Classification of Partial Differential Equations, Cauchy Problem, Cauchy Kowalevski Theorem, Classification of Second Order Partial Differential Equations: normal forms and characteristics. Initial and Boundary Value Problems: Lagrange-Green's identity and uniqueness by energy methods. (8L)

Methods of Solution, Methods of separation of variables, Characteristic method, Green's function, Fourier transform (6L)

Stability theory, energy conservation and dispersion. (4L)

Laplace equation: mean value property, weak and strong maximum principle, Green's function, Poisson's formula, Dirichlet's principle, existence of solution using Perron's method (without proof). (5L)

Heat equation: initial value problem, fundamental solution, weak and strong maximum principle and uniqueness results. (5L)

Wave equation: uniqueness, D'Alembert's method, method of spherical means and Duhamel's principle. (5L)

Introduction to Hilbert Spaces of Functions, Sobolev spaces, Weak solution (4L)

Textbooks:

1. G. B. Folland, “Introduction to Partial Differential Equations”, Princeton University Press, 1995

2. L.C. Evans, Partial Differrential Equations, Graduate Studies in Mathematics, Vol. 19, AMS, Providence, 1998.

References:

3. F. John, Partial Differential Equations, 3rd ed., Narosa Publ. Co., New Delhi,1979.

4. E. Zauderer, Partial Differential Equations of Applied Mathematics, 2nd ed., John Wiley and Sons, New York, 1989.

5. M. Renardy and R.C. Rogers, An Introduction to Partial Differential Equations, Texts in Appl. Math. 13, Springer, 1993

6. M.H. Protter and H. F. Weinberger, Maximum Principles in Differential Equations, Prentice Hall, 1967