MA 5030: Partial Differential Equations (3-0-0-3)

Department of Mathematics,
IIT Hyderabad

Syllabus

First order partial differential equations:

Surfaces and Curves, Classification of 1st order p.d.e. Classification of solutions-Pfaffian differential equations - Quasi-linear equations, Lagrange's method-compatible systems-Charpit's method- Jacobi's method-Integral surfaces passing through a given curve- method of characteristics for quasi-linear and non-linear p.d.e., Monge cone, characteristic strip.

Second order partial differential equations:

Origin of second order p.d.e's - classification of second order p.d.e's. Wave equation - D'Alemberts' solution - vibrations of a finite string - existence and uniqueness of solution - Riemann method. Laplace equation - boundary value problems, Uniqueness and continuity theorems - Dirichlet problem for a circle - Dirichlet problem for a circular annulus - Neumann problem for a circle - Theory of Green's function for Laplace equation. Heat equation - Heat conduction problem for an infinite rod - Heat conduction in a finite rod - existence and uniqueness of the solution.

References:

1. John F., Partial Differential Equations, 2nd Edition, Springer-Verlag. 1981.

2. Ian Sneddon, Elements of Partial Differential Equations, Dover Publications, 2006.

3. Tyn MynT, U., and Loknath Debnath: Partial Differential Equations for Scientists and Engineers, North Holland Publisher, 3rd Edition, 1987.

4. Zachmanoglou, E.C. and Thoe, D.W., Introduction to Partial Differential Equations with Applications. Dover Publications, 1987.