Subject Code : P8MA8

CC VIII - PARTIAL DIFFERENTIAL EQUATIONS

UNIT I

First Order P.D.E. – Curves and Surfaces – Genesis of First Order P.D.E. – Classification of Integrals – Linear Equations of the First Order – Pfaffian Differential Equations – Compatible Systems – Charpit's Method – Jacobi's Method

UNIT II

Integral Surfaces Through a Given Curve – Quasi-Linear Equations – Non-linear First Order P.D.E.

UNIT III

Second Order P.D.E.: Genesis of Second Order P.D.E. – Classification of Second Order P.D.E. One-Dimensional Wave Equation – Vibrations of an Infinite String – Vibrations of a Semi-infinite String –Vibrations of a String of Finite Length (Method of Separation of Variables)

UNIT IV

Laplace's Equation: Boundary Value Problems – Maximum and Minimum Principles – The Cauchy Problem – The Dirichlet Problem for the Upper Half Plane – The Neumann Problem for the Upper Half Plane – The Dirichlet Interior Problem for a Circle - The Dirichlet Exterior Problem for a Circle – The Neumann Problem for a Circle – The Dirichlet Problem for a Rectangle – Harnack's Theorem – Laplace's Equation – Green's Function

UNIT V

Heat Conduction Problem – Heat Conduction –Infinite Rod Case – Heat Conduction Finite Rod Case – Duhamel's Principle – Wave Equation – Heat Conduction Equation

TEXT BOOK(S)

An Elementary Course in Partial Differential Equations by T.Amarnath, Narosa, 1997.

UNIT – I - Chapter 1: Sections 1.1 to1.8
UNIT – II - Chapter 1: Sections 1.9 to1.11
UNIT – III - Chapter 2: Sections 2.1 to 2. 3. 5, except 2. 3. 4
UNIT – IV - Chapter 2: Sections 2.4 to 2.4.11
UNIT – V - Chapter 2: Sections 2.5 to 2.6.2

REFERENCE(S)

[1] l.c. Evans, Partial Differential Equaitons, Graduate Studies in Mathematics, Vol. 19 AMS, 1998.
[2] I.N. Snedden, Elements of Partial Differential Equations.
[3] F. John, P. Prasad, Partial Differential Equations.