Subject Code : RNENS5

PAPER V – ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Unit I

The general solution of the homogeneous equation – The use of one known solution to find another – The method of variation of parameter – Power series solutions – series solutions of first order equations – Second order linear equations – ordinary points – Regular singular points – Gauss hyper geometric equations – the point oat infinity.

Unit II

Legendre Polynomials - Properties of Legendre polynomials – Bessel functions – The gamma function – Properties of Bessel function – linear systems – Homogeneous Linear system with constant coefficients.

Unit III: The existence and uniqueness of solutions

The method of Successive approximation – Picard's theorem – Types of critical points – Critical points and stability for linear systems – Stability by Liapunov's direct method.

Unit IV

First order partial differential equations – Linear equations of the first order – Pfafian differential equations – Compatible systems – Charpit's method – Jacobi's method – Integral surface through a given circle.

Unit V

Genesis of second order PDE – Classifications of second order PDE – one dimensional wave equation – Vibration of an infinite string, Vibrations of semi-infinite string, Vibrations of a string of finite length (Method of separation of Variables) - Heat conduction problem – Heat conduction – Infinite rod case and heat conduction – finite rod case.

Text Book:

1. G.F. Simmons – Differential Equations with Applications and Historical Notes, TMH, New Delhi
   Unit I - Chapter 3: Sections – 15, 16, 19, Chapter 5: Sections - 26 to 31
   Unit II: Chapter 6: Sections – 32 to 36, Chapter 7 : Sections – 37,38.
   Unit III: Chapter 8: Sections – 41 to 43, Chapter 7: Sections – 56, 57.
2. T.Amarnath, "An Elementary Course in Partial Differential Equations", Narosa, New Delhi, 1997.
   Unit IV – Chapter 1: Sections – 1.4 to 1.9
   Unit V - Chapter 2: Sections – 2.1, 2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.5, 2.5.1, 2.5.2

References

1. W.T.Reid, Ordinary Differential Equations, John Wiley, New York, 1971.
2. E.A.Coddington and E.Levinson, Theory of ODE, Mc Graw Hill Publishing Company, New york, 1955
3. J.N. Sneddon, Elements of Partial Differential Equations, Mc Graw Hill Publishing Company, New york, 1957.