Subject Code : P8MA4

CC IV - ORDINARY 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 parameters – Power Series solutions. A review of power series – Series solutions of first order equations – Second order linear equations; Ordinary points.

UNIT II

Regular Singular Points – Gauss's hypergeometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.

UNIT III

Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard's Theorem.

UNIT IV

Oscillation Theory and Boundary value problems – Qualitative Properties of Solutions – Sturm Comparison Theorems – Eigenvalues, Eigenfunctions and the Vibrating String.

UNIT V

Nonlinear equations: Autonomous Systems; the phase plane and its phenomena – Types of critical points; Stability – critical points and stability for linear systems – Stability by Liapunov's direct method – Simple critical points of nonlinear systems.

TEXT BOOK(S)

G.F. Simmons, Differential Equations with Applications and Historical Notes, TMH, New Delhi, 1984.

UNIT – I - Chapter 3: Sections 15, 16, 19 and Chapter 5: Sections 25 to 27
UNIT – II - Chapter 5: Sections 28 to 31 and Chapter 6: Sections 32 to 35
UNIT – III - Chapter 7: Sections 37, 38 and Chapter 11: Sections 55, 56
UNIT – IV - Chapter 4: Sections 22 to 24
UNIT – V - Chapter 8: Sections 42 to 44

REFERENCE(S)

[1] W.T. Reid, Ordinary Differential Equations, John Wiley & Sons, New York, 1971.
[2] E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equaitons, McGraw Hill Publishing Company, New York, 1955.