DISCIPLINE SPECIFIC COURSES (DSE) - OPEN ELECTIVE COURSE 2

SEMESTER - I

Course Code: MAT07E507 **Course Name: DIFFERENTIAL AND INTEGRAL EQUATIONS**

No. of Credits: 4 **Teaching Hours: 60**

Only for Students from Other Departments

TEXTBOOK: 1. SHEPLEY ROSS, DIFFERENTIAL EQUATIONS, Wiley student edition, 2018.

TEXTBOOK 2. HILDEBRAND F.B., METHODS OF APPLIED MATHEMATICS (2nd Edn.), Prentice-Hall of India, New Delhi, 1972.

Course Outcome(CO)s: On successful completion of the course student will be able to:

CO 1: Explain the existence and uniqueness theorem of ordinary differential equations.

CO 2: Solve systems of homogeneous and non- homogeneous systems of ordinary differential equations

CO 3: Solve Sturm Liouville boundary problems and study Fourier series, classify the linear integral equations and demonstrate the techniques of converting the initial and boundary value problem to integral equations and vice versa.

CO 4: Develop the technique to solve the Fredholm integral equations with separable kernels.

CO 5: Develop and demonstrate the technique of solving integral equations by successive approximations

CO 6: Solve the integral equation by applying Hilbert Schmidt Theorem.

Prerequisites: Basic Calculus

UNIT I

Systems of Linear Differential Equations: Differential Operators and an operators Method, Basic theory of linear systems in normal form: two equations in two unknown functions, Homogeneous linear systems with constant coefficients: two equations with two unknown functions, The matrix method for homogeneous linear systems with constant coefficients: two equations in two unknown functions, The matrix method for homogeneous linear systems with constant coefficients: n equations in n unknown functions.

[Chapter 7: Sections 7.1, 7.3, 7.4, 7.6, 7.7 from Text 1]

UNIT II

Existence and uniqueness theory: The fundamental existence and uniqueness theorem(statement only). The theory of linear differential equation: Introduction, basic theory of homogeneous linear system, further theory of the homogeneous linear system, the nonhomogeneous linear system, basic theory of the nth order homogeneous linear differential equation, further properties of the nth order homogeneous linear differential equation.

[Chapter 10 & 11: Sections 10.2, 11.1, 11.2, 11.3, 11.4, 11.5, 11.6 from Text 1]

UNIT III

The Sturm Liouville boundary value problems and Fourier series: Sturm Liouville problems, orthogonality of characteristic functions, the expansion of a function in a series of orthonormal functions, Trigonometric Fourier series.

[Chapter 12 : Sections 12.1, 12.2, 12.3 and 12.4 from Text 1]

UNIT IV

Integral Equations: Introduction; Relations between differential and integral equations; The Green's function; Fredholm equations with separable kernels; Illustrative example; Hilbert-Schmidt theory; Iterative methods for solving equations of the second kind; The Neumann series.

[Chapter 3: 3.1, to 3.3, 3.6 to 3.10 from Text 2]

REFERENCES

[1] A. Chakrabarti: Elements of ordinary Differential Equations and special functions; Wiley Eastern Ltd, New Delhi; 1990
[2] E.A. Coddington: An Introduction to Ordinary Differential Equations' Prentice Hall of India ,New Delhi; 1974
[3] R. Courant and D.Hilbert: Methods of Mathematical Physics-Vol I; Wiley Eastern Reprint; 1975
[4] P. Hartman: Ordinary Differential Equations; John Wiley & Sons; 1964
[5] F. John: Partial Differential Equations; Narosa Pub House New Delhi; 1986
[6] Phoolan Prasad Renuka Ravindran: Partial Differential Equations; Wiley Eastern Ltd, New Delhi; 1985
[7] L.S. Pontryagin: A course in ordinary Differential Equations; Hindustan Pub. Corporation, Delhi; 1967

Mapping of COs to PSOs **MAT07E507: DIFFERENTIAL AND INTEGRAL EQUATIONS**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	✓	✓			✓
CO 2	✓	✓		✓	
CO 3	✓	✓	✓	✓	✓
CO 4	✓	✓	✓		
CO 5	✓		✓		✓
CO 6	✓	✓	✓	✓	✓