Introduced New course from 2014-15 1.1.2
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Course No :MAT511 **Number of Credits :6**

Semester – IV - Linear Integral Equations

Unit - I:

Definition of Integral Equations and Linear Integral Equations, Types of Linear Integral Equations, Special kinds of Kernels: Separable or degenerate kernel, symmetric kernel, convolution-type kernels, Eigenvalues and eigenfunctions of kernels, Solution of linear integral equations, Verification of solution of linear integral equations. (10 hours)

Unit -II:

Conversion of Boundary Value Problem to integral equations, conversion of Initial Value Problems to integral equations, conversion of Fredholm integral equations to Boundary Value Problems, conversion of Volterra integral equations into Initial Value Problems. (15 hours)

Unit - III:

Methods of obtaining solution for Fredholm integral equations, Fredholm integral equations with separable kernels, Approximating kernels by separable kernels, Method of successive approximation, Iterated kernel method for Fredholm integral equations, Resolvant kernels and their properties, Methods of solutions for Volterra integral equations, Volterra type kernel, Method of differentiation, Method of successive approximations, Method of iterative kernels, Resolvant kernels and its use to solve Volterra integral equations. (20 hours)

Unit -IV:

Symmetric kernel, trace of a kernel, Fredholm operator, Fundamental properties of symmetric kernels, Eigenvalues and eigenfunctions of symmetric kernel and their properties, normalized eigenfunctions, Iterated kernel of symmetric kernels and their properties, Truncated kernel of symmetric kernel and necessary and sufficient condition for symmetric kernel to be separable, The Hilbert-Schmidt theorem, Solution of a Symmetric Integral equations. (15 hours)

Unit -V:

Integral Transform Methods, Recall of Laplace and Fourier Transforms, Applications to Volterra integral equations with convolution-type kernel, examples, Green's function approach for ordinary differential equations. (15 hours)

Text Books:

Linear Integral Equations Theory and Applications, R. P. Kanwal (Academic Press, 1971)

Reference Books:

Integral Equations, Shanti Swarup (Krishna Publication)

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Old Course upto 2014

Semester – IV
Paper – VI (B) Functional Analysis – II

Unit – I
The Dirac delta function and Delta Sequences: The Heaviside function, The Dirac delta functional the delta sequence, The unit dipole, the Heaviside sequences. (15 Lectures)

Unit- II
Schwartz – Sobolev theory of Distributions: Definitions, Test Functions, Linear Functionals and distributions, Algebraic and Analytic Operations on Distributions, Support and singular support of distribution, Transformation properties, Convergence of distributions. Fourier series (15 Lectures)

Unit- III
Tempered distributions and the Fourier Transforms: The space of rapidly decreasing functions, The spaces of Tempered Distributions, multipliers, Fourier Transform and its properties. (15 Lectures)

Unit- IV
Direct product and convolutions of Distributions: Definition of the direct product, the direct product of tempered distributions. The Fourier Transform of the direct product of tempered distributions, Convolution of the distributions, Fourier Transform. (15 Lectures)

Unit- V
Laplace Transform: Review of classical results, The Laplace Transform of distributions, The Laplace Transform of distributional Derivatives and vice versa. (15 Lectures)

Text Books:

1. R. P. Kanwal: Generalized functions Theory and Technique Academic Press Inc. New York (1983)

2. R. S. Pathak: A course in Distribution Theory and Applications, Narosa Pub. House New Delhi, 2001

3. A. H. Zemanian: Distribution Theory and Transform Analysis McGraw Hill New York (1965)