SPECIMEN OF ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

Department of PHYSICS

Bankura Christian College

ACADEMIC YEAR 2023 (Semester: 4th SEM (H))

4th Semester (H) (March 2023 to June 2023) [Math Methods – 3][C8/T8]

Submitted by: Dr. Chinmoy Taraphdar

1. Linear Vector Spaces:

Abstract Systems. Binary Operations and Relations. Introduction to Groups and Fields. Vector Spaces and Subspaces. Linear Independence and Dependence of Vectors. Basis and Dimensions of a Vector Space. Change of basis. Homomorphism and Isomorphism of Vector Spaces. Linear Transformations. Algebra of Linear Transformations. Non-singular Transformations. Representation of Linear Transformations by Matrices. Inner products. Gram-Schmidt orthogonalization. Orthogonal and unitary transformations and their matrix representations.

2. Integrals Transforms:

Fourier Transforms: Fourier Integral theorem. Fourier Transform. Examples. Fourier transform of trigonometric, Gaussian, finite wave train & other functions. Representation of Dirac delta function as a Fourier Integral. Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem. Properties of Fourier transforms (translation, change of scale, complex conjugation, etc.). Three dimensional Fourier transforms with examples. Application of Fourier Transforms to differential equations: One dimensional Wave and Diffusion/Heat Flow Equations

Laplace Transform: LT of Elementary functions. Properties of LTs, Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions. Convolution Theorem. Inverse LT. Application of Laplace Transforms to 2nd order Differential Equations: Damped Harmonic Oscillator, Simple Electrical Circuits, Coupled differential equations of 1st order. Solution of heat flow along infinite bar using Laplace transform.

3. Eigen-values and Eigenvectors:

Cayley- Hamiliton Theorem. Diagonalization of Matrices. Solutions of Coupled Linear Ordinary Differential Equations. Functions of a Matrix.

MONTH/YEAR	WEEK	PORTIONS
March 2023	3	**Linear Vector Spaces:** Abstract Systems. Binary Operations and Relations. Introduction to Groups and Fields. Vector Spaces and Subspaces. Linear Independence and Dependence of Vectors. Basis and Dimensions of a Vector Space. Change of basis.

	4	**Linear Vector Spaces:** Homomorphism and Isomorphism of Vector Spaces. Linear Transformations. Algebra of Linear Transformations. Non-singular Transformations.
MONTH/YEAR	**WEEK**	**PORTIONS**
April 2023	1	**Linear Vector Spaces:** Representation of Linear Transformations by Matrices. Inner products. Gram-Schmidt orthogonalization. Orthogonal and unitary transformations and their matrix representations.
	2	**Fourier Transforms:** Fourier Integral theorem. Fourier Transform. Examples. Fourier transform of trigonometric, Gaussian, finite wave train & other functions. Representation of Dirac delta function as a Fourier Integral.
	3	**Integrals Transforms:** Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem. Properties of Fourier transforms (translation, change of scale, complex conjugation, etc.).
	4	**Integrals Transforms:** Three dimensional Fourier transforms with examples. Application of Fourier Transforms to differential equations:
MONTH/YEAR	**WEEK**	**PORTIONS**
May 2023	1	**Integrals Transforms:** One dimensional Wave and Diffusion/Heat Flow Equations
	2	**Integrals Transforms:** Laplace Transform: LT of Elementary functions. Properties of LTs, Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions,
	3	**Integrals Transforms:** Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions.
	4	**Integrals Transforms:** Convolution Theorem. Inverse LT. Application of Laplace Transforms to 2nd order Differential Equations: Damped Harmonic Oscillator,
MONTH/YEAR	**WEEK**	**PORTIONS**
	1	**Integrals Transforms:** Simple Electrical Circuits, Coupled differential equations of 1st order. Solution of heat flow along infinite bar using Laplace transform.

June 2023	2	**Eigen-values and Eigenvectors:** Cayley- Hamiliton Theorem. Diagonalization of Matrices. Solutions of Coupled Linear Ordinary Differential Equations. Functions of a Matrix.
	3	**Practice Class Test – 1 (25 Marks)**
	4	**Practice Class Test – 2 (25 Marks)**