Lesson Plan for Applied Mathematics – II (BS-112)

Subject : Applied Mathematics – II **Total Teaching Weeks : 16**

Subject Code : BS-112 **Credit : 04**

S.No.	Contents	No. of Lectures
	UNIT - I	
1	Complex Analysis – I : Complex Numbers and Their Geometric Representation, Polar Form of Complex Numbers	1
2	Powers and Roots, Derivative	1
3	Analytic Function, Cauchy–Riemann Equations. Laplace's Equation, Exponential Function, Trigonometric and Hyperbolic Functions.	1
4	Euler's Formula, de'Moivre's theorem (without proof), Logarithm	1
5	General Power, Principal Value	1
6	Singularities and Zeros	1
7	Infinity, Line Integral in the Complex Plane,	1
8	Cauchy's Integral Theorem, Cauchy's Integral Formula,	1
9	Derivatives of Analytic Functions, Taylor and Maclaurin Series.	1
	UNIT - II	
10	Complex Analysis – II: Laurent Series, Residue Integration Method.	1
11	Residue Integration of Real Integrals, Linear Fractional Transformations (Möbius Transformations),	1
12	Geometry of Analytic Functions: Conformal Mapping,	1
13	Linear Fractional Transformations (Möbius Transformations),	1
14	Special Linear Fractional Transformations, Conformal Mapping by Other Functions,	1
15	Applications: Electrostatic Fields, Use of Conformal Mapping.	1
16	Modeling, Heat Problems, Fluid Flow.	1
17	Poisson's Integral Formula for Potentials	1

	UNIT - III	
18	Laplace Transforms: Definitions and existence (without proof), properties,	1
19	First Shifting Theorem (Shifting), Transforms of Derivatives and Integrals and ODEs, Unit Step Function (Heaviside Function).	1
20	Second Shifting Theorem (t-Shifting), Short Impulses	1
21	Dirac's Delta Function	1
22	Partial Fractions, Convolution. Integral Equations, Differentiation and Integration of Transforms	1
23	Solution of ODEs with Variable Coefficients, Solution of Systems of ODEs	1
24	Inverse Laplace transform and its properties	1
25	Fourier Analysis: Fourier Series, Arbitrary Period, Even and Odd Functions.	1
26	Half-Range Expansions, Sturm–Liouville Problems	1
27	Fourier Integral, Fourier Cosine and Sine Transforms, Fourier Transform	1
28	Usage of fourier analysis for solution of ODEs	1
29	Inverse Fourier transform and its properties	1
	UNIT - IV	
30	Partial Differential Equations (PDEs): Basic Concepts of PDEs.	1
31	Modeling: Vibrating String, Wave Equation. Solution by Separating Variables.	1
32	Use of Fourier Series. D'Alembert's Solution of the Wave Equation.	1
33	Characteristics. Modeling: Heat Flow from a Body in Space. Heat Equation:Solution by Fourier Series.	1
34	Steady Two-Dimensional Heat Problems. Dirichlet Problem.	1
35	Heat Equation: Modeling Very Long Bars.	1
36	Solution by Fourier Integrals and Transforms.	1
37	Modeling: Membrane, Two-Dimensional Wave Equation.	1
38	Rectangular Membrane. Laplacian in Polar Coordinates. Circular Membrane.	1
39	Laplace's Equation in Cylindrical and Spherical Coordinates.	1
40	Potential. Solution of PDEs by Laplace Transforms.	1