APPLIED MATHEMATICS [SH 551] - SYLLABUS

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Lecture	:	3	Year	:	II
Tutorial	:	1	Part	:	II
Practical	:	0			

Course Objective

This course focuses on several branches of applied mathematics. The students are exposed to complex variable theory and a study of the Fourier and Z-Transforms, topics of current importance in signal processing. The course concludes with studies of the wave and heat equations in Cartesian and polar coordinates.

1. Complex Analysis (18 hours)

1.1 Complex Analytic Functions
1.1.1 Functions and sets in the complex plane
1.1.2 Limits and Derivatives of complex functions
1.1.3 Analytic functions. The Cauchy –Riemann equations
1.1.4 Harmonic functions and it's conjugate
1.2 Conformal Mapping
1.2.1 Mapping
1.2.2 Some familiar functions as mappings
1.2.3 Conformal mappings and special linear functional transformations
1.2.4 Constructing conformal mappings between given domains
1.3 Integral in the Complex Plane
1.3.1 Line integrals in the complex plane
1.3.2 Basic Problems of the complex line integrals
1.3.3 Cauchy's integral theorem
1.3.4 Cauchy's integral formula
1.3.5 Supplementary problems
1.4 Complex Power Series, Complex Taylor series and Lauren series

1.4.1 Complex power series

1.4.2 Functions represented by power series

1.4.3 Taylor series, Taylor series of elementary functions

1.4.4 Practical methods for obtaining power series, Laurent series

1.4.5 Analyticity at infinity, zeros, singularities, residues, Cauchy's residue theorem

1.4.6 Evaluation of real integrals

2. The Z-Transform (9 hours)

2.1 Introduction

2.2 Properties of Z-Transform

2.3 Z- transform of elementary functions

2.4 Linearity properties

2.5 First shifting theorem, second shifting theorem, Initial value theorem,

2.6 Final value theorem, Convolution theorem

2.7 Some standard Z- transform

2.8 Inverse Z-Transform

2.9 Method for finding Inverse Z-Transform

2.10 Application of Z-Transform to difference equations

3. Partial Differential Equations (12 hours)

3.1 Linear partial differential equation of second order, their classification and solution

3.2 Solution of one dimensional wave equation, one dimensional heat equation, two dimensional heat equation and Laplace equation (Cartesian and polar form) by variable separation method

4. Fourier Transform (6 hours)

4.1 Fourier integral theorem, Fourier sine and cosine integral; complex form of Fourier integral

4.2 Fourier transform, Fourier sine transform, Fourier cosine transform and their properties

4.3 Convolution, Parseval's identity for Fourier transforms

4.4 Relation between Fourier transform and Laplace transform

References:

1. E. Kreyszig, “Advance Engineering Mathematics”, Fifth Edition, Wiley, New York.
2. A. V. Oppenheim, “Discrete-Time Signal Processing”, Prentice Hall, 1990.
3. K. Ogata, “Discrete-Time Control System”, Prentice Hall, Englewood Cliffs, New Jersey, 1987.