EC/EE-207 **COMPLEX AND NUMERICAL ANALYSIS** **L T P C**
3 1 - 3

COURSE OBJECTIVES:

1. To provide knowledge on complex analysis.
2. To provide knowledge on complex integration.
3. To provide knowledge on singularities, poles and residues.
4. To provide knowledge on numerical solution of ordinary differential equations.
5. To provide knowledge on numerical solution of partial differential equations.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. demonstrate knowledge on Complex Functions, Complex Integration, Taylor's and Laurent's expansions , Ordinary Differential Equations, Partial Differential Equation.
2. evaluate complex line integrals with the help of Cauchy's integral theorem, Cauchy's integral formula.
3. apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.
4. find numerical solution of ordinary differential equations and Partial Differential Equation.
5. solve integral functions using Cauchy's residue theorem to find residues.

UNIT I **(12)**

Complex Functions :

Introduction - Derivative of complex function - Analytic functions - The necessary and sufficient conditions for the analyticity of the function (without proof) - Cauchy-Riemann equations in polar form - Harmonic functions.

Milne-Thomson method, orthogonal system.

UNIT II **(12)**

Complex Integration : Complex integration - Line integrals

Cauchy's integral theorem, Cauchy's integral formulae.

UNIT III **(12)**

Series and Residues:

Taylor's and Laurent's expansions (without proofs).

Singularities - Poles and Residues - Cauchy's residue theorem (without proof).

UNIT IV **(12)**

Numerical Solutions of Ordinary Differential Equations (First order) :

Solution by Taylor's series - Picards method.

Euler's method - Runge-Kutta method of fourth order.

UNIT V **(12)**

Numerical Solutions of Partial Differential Equation :

Classification of Partial differential equations of the second order - Laplace-s equation.

Poisson's equation.

LEARNING RESOURCES:

TEXT BOOK(s):

B.S.Grewal - Higher Engineering Mathematics, Khanna publishers, 40th edition, 2007.

REFERENCE BOOK(s):

Erwin Kreyszig - Advanced Engineering Mathematics, 8th edition, New Age International (P) Ltd., 2007.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/