III Year I Semester	**L**	**T**	**P**	**C**
Code: 20MA5409	**3**	**0**	**0**	**3**

COMPLEX VARIABLES AND LINEAR PROGRAMMING

Course Objectives:

1. This course is aimed to provide an introduction to the theories of functions of complex variables; analytic functions; contour integrations and to furnish an introduction to their applications.
2. This course is aimed to provide an Introduction to formulation of a Linear Mathematical Model and its optimum solution.

Course Outcomes: Student can be able to

1. Analyse limit, continuity and differentiation of functions of Complex Variables. Understand Cauchy Riemann equations, analytic functions and various of an analytic function.
2. Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals. Represent functions as Taylor and Laurent series.
3. Classify singularities and poles; find residues and evaluate complex integrals by using Residues.
4. Understand Conformal Mapping.
5. Understand the construction of Linear Mathematical Models for the given phenomena, and finding it's optimum solution by using graphical and simplex methods.

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1	-	-	-	-	-	-	-	-	1
2	3	2	1	-	-	-	-	-	-	-	-	1
3	3	2	1	-	-	-	-	-	-	-	-	1
4	3	2	1	-	-	-	-	-	-	-	-	1
5	3	2	1	1	-	-	-	-		-	-	1

UNIT – I: **Functions of a complex variable**

Introduction – Continuity – Differentiability – Analyticity – Properties – CauchyRiemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.

UNIT–II: **Complex Integration and Series**

Line integral -evaluation along the path and by indefinite integration - Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs).

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.

UNIT – III: **Integration using Residues**
Singular point – isolated singular point – pole of order m – Essential singularity– Residues – Evaluation of residue by formula and by Laurent series - Residue theorem. Evaluation of integrals of the type $\int_{-\infty}^{\infty} f(x)dx; \int_{C}^{C+2\pi} f(\cos\theta, \sin\theta)d\theta$

UNIT – IV: Conformal Mapping
Transformation by (n positive integer). Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – Properties – invariance of circles and cross ratio – determination of bilinear mapping 3 given points.

UNIT – V: **Linear Programming Problems**
Introduction - Graphical Approach for Solving Linear Programming Problems - Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format.

Text Books:
1. Advanced Engineering Mathematics: BS Grewal, Khanna Publishers(42nd Ed).
2. Complex Variables and Statistical Methods by T K V Iyengar, Krishna Gandhi S Chand Pub
3. "Operations Research" by S.D. Sharma published by Kedarnath and Ramnath Co.

Reference Books:
1. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley India Edition.
2. Advanced Engineering Mathematics: Michael Greenberg, Pearson.
3. "Linear Programming and Network Flows" by Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali published by John Wiley and Sons, India, 2004, 2nd edition.
4. "Operations Research: An Introduction" by Hamdy A. Taha published by Prentice-Hall India, 2006, 8th edition.

Web Links:
- https://nptel.ac.in/courses/111/103/111103070/
- https://nptel.ac.in/courses/112106134