III B.Tech – I Semester (20MA5409) COMPLEX VARIABLES AND LINEAR PROGRAMMING

| Int. Marks | Ext. Marks | Total Marks | L | Т | Р | С |
|------------|------------|-------------|---|---|---|---|
| 30 | 70 | 100 | 3 | - | - | 3 |

Pre-Requisites: Linear Algebra & Vector Calculus

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.

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 Laurentseries.

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.

Course Outcomes:

After successful completion of the course, the students will be able to:

| S.No | Course Outcome | | | | | | | |
|------|---|----|--|--|--|--|--|--|
| 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. | L2 | | | | | | |
| 5. | Understand the construction of Linear Mathematical Models for the given phenomena, and finding it's optimum solution by using graphical and simplex methods. | L2 | | | | | | |

Correlation of COs with POs& PSOs:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|------------|------------|-----|-----|------------|-----|------------|------------|------------|-----|-------------|------|------|------|------|
| CO1 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | | |
| CO2 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | | |
| CO3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | | |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | | |
| CO5 | 3 | 2 | 1 | 1 | - | - | _ | - | | - | - | 1 | | |

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-HallIndia, 2006, 8th edition.

Web Links:

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