

**Syllabus for the First Degree Programme in Mathematics
of the University of Kerala.**

**Semester VI
Complex Integration(Elective)**

Code: MM 1651.3
No. of credits: 2

Instructional Hours per week: 3

Module 1 Complex Integration

- Curves in the complex plane, Smooth and piecewise smooth curves, Integral of a complex function along a curve, Evaluation of line integrals by reducing to definite integral, Examples to illustrate that complex line integral generally depend on the contour.
- Anti-derivative of a continuous function, Independence of the path of integration for functions having anti-derivative in a domain.
- Cauchy's theorem and Cauchy-Goursat theorem(without proof). Simply connected and multiply connected domains and extension of Cauchy's theorem.
- Cauchy's integral formula. Derivatives of analytic functions, Morera's theorem, Liouville's theorem, The fundamental theorem of algebra.

Module 2 Residue Theory

- Review of Taylor's and Laurent's series, Isolated singular point of a complex function and classification of such singularities-removable singularity, poles and essential singularity.
- Residue of a function at a singular point, Calculation of residues.
- Cauchy's residue theorem, Evaluation of line integrals using Residue theorem, Use of Residue theorem in evaluating definite integrals of rational functions involving sines and cosines. Evaluation of improper real integrals.

Text: Ruel V. Churchill and James Ward Brown, *Complex Variables and Its Applications*, 8th Edition, McGraw-Hill International.

References:

1. J. M. Howie, *Complex Analysis*, Springer.
2. V. Karunakaran, *Complex Analysis*

Distribution of Instructional hours:

Module 1: 27 hours; Module 2: 27 hours