

## THIRD SEMESTER

**Course Name: Advanced Complex Analysis**

**Course code: MAT601**

**Credit: 4**

### Syllabus

Algebra and Topology of the complex plane. Geometry of the complex plane, Complex differentiation. :Power series and its convergence, Cauchy-Riemann equations, Harmonic functions, Conformal Mapping: Circle and line revisited, Conformal Mapping, Möbius transformations, Other Mapping, Integration along a contour, The fundamental theorem of calculus, Homotopy, Cauchy's theorem, Cauchy integral formula, Cauchy's inequalities and other consequences, Winding number, Open mapping theorem, Schwarz reflection Principle, Singularities of a holomorphic function, Laurent series, The residue theorem, Argument principle, Rouché's theorem, Uniqueness of analytic continuation.

#### **BLOCK I: ANALYTIC FUNCTIONS**

Unit 1: Complex Number

Unit2: Concept of Functions, Limit and Continuity.

Unit3: Analytic Function ( Cauchy-Riemann equations)

Unit4: Power series

#### **BLOCK II: CONFORMAL MAPPING**

Unit5: Conformal Mapping.

Unit6: Möbius transformations and Other Mapping

#### **BLOCK III: COMPLEX INTEGRATION**

Unit7: Complex IntegrationI

Unit8: Complex IntegrationII

Unit9: Cauchy integral formula, Cauchy's inequalities and other consequences.

Unit10: Winding number, Open mapping theorem, Schwarz Lemma.

### **BLOCK III : SINGULARITIES AND RESIDUE**

Unit11: Singularities

Unit12: The residue theorem,

Unit13: Argument principle, Rouché's theorem.

Unit14: Uniqueness of analytic continuation