Course Title: Advance Mathematics- III (Complex Analysis and Differential Geometry)
Course Rating: 4 Cr. Hours

The Concept of Analytic Functions
- Complex numbers, Complex planes, Complex functions
- Analytic functions
- Entire functions
- Harmonic functions
- Elementary functions: Trigonometric, Complex exponential, Logarithmic and hyperbolic functions

Infinite Series
- Power series, Derived series, Radius of convergence
- Taylor series and Laurent series

Conformal Representation
- Transformation, conformal transformation
- Linear transformation
- Möbius transformations

Complex Integration
- Complex integrals
- Cauchy-Goursat theorem
- Cauchy's integral formula and their consequences
- Liouville's theorem
- Morera's theorem
- Derivative of an analytic function

Singularity and Poles
- Review of Laurent series
- Zeros, Singularities
- Poles and residues
- Cauchy's residue theorem
- Contour Integration

Expansion of Functions and Analytic Continuation
- Mittag-Leffler theorem
- Weierstrass's factorization theorem
- Analytic continuation

Theory of Space Curves
- Introduction, Index notation and summation convention
- Space curves, Arc length, Tangent, Normal and binormal
- Osculating, Normal and rectifying planes
- Curvature and torsion
- The Frenet-Serret theorem

- Natural equation of a curve
- Involutes and evolutes, Helices
- Fundamental existence theorem of space curves

Theory of Surfaces

- Coordinate transformation
- Tangent plane and surface normal
- The first fundamental form and the metric tensor
- The second fundamental form
- Principal, Gaussian, Mean, Geodesic and normal curvatures
- Gauss and Weingarten equations
- Gauss and Codazzi equations
- **Evaluation Criteria**

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

Recommended Books

1. H. S. Kasana, *Complex Variables*: *Theory and Applications*, (Prentice Hall, 2005)
2. M. R. Spiegel, *Complex Variables*, (McGraw Hill Book Company, 1974)
3. J. W. Brown, R. V. Churchill, *Complex Variables and Applications,* (McGraw Hill, 2009)
4. Louis L. Pennisi, *Elements of Complex Variables*, (Holt, Linehart and Winston, 1976)
5. W. Kaplan, *Introduction to Analytic Functions*, (Addison-Wesley, 1966)
6. R. S. Millman and G.D. Parker, *Elements of Differential Geometry,* (Prentice-Hall, 1977)
7. E. Kreyzig, *Differential Geometry,* (Dover Publications, 1991)
8. M. M. Lipschutz, *Schaum's Outline of Differential Geometry,* (McGraw Hill, 1969)
9. D. Somasundaram, *Differential Geometry,* (Narosa Publishing House, 2005)