

## **Mathematics I**

### Course Objectives:

To provide students a sound knowledge of calculus and analytic geometry to apply them in their relevant fields.

#### 1. Derivatives and their Applications (14 hours)

- a. Introduction
- b. Higher order derivatives
- c. Mean value theorem
  - i. Rolle's Theorem
  - ii. Lagrange's Mean Value Theorem
  - iii. Cauchy's Mean Value Theorem
- d. Power series of Single Valued Function
  - i. Taylor's Series
  - ii. Maclaurin's Series
- e. Indeterminate forms: L'Hospital Rule
- f. Asymptotes to Cartesian and Polar Curves
- g. Pedal equations to Cartesian and Polar Curves: Curvature and Radius of Curvature

#### 2. Integration and its Applications (11 hours)

- a. Introduction
- b. Definite Integrals and their properties
- c. Improper Integrals
- d. Differentiation under Integral Sign
- e. Reduction formula: Beta Gamma functions
- f. Application of Integrals for finding areas, arc length, surface and solid of revolution in the plane for Cartesian and Polar curves

#### 3. Plane Analytic Geometry (8 hours)

- a. Transformation of Coordinates: Translation and rotation
- b. Ellipse and Hyperbola: Standard forms. Tangent, and Normal
- c. General equation of conics in Cartesian and Polar forms

#### 4. Ordinary Differential Equations and their Applications (12 hours)

- a. First order and first degree Differential equations
- b. Homogenous Differential equations
- c. Linear differential equations
- d. Equations reducible to linear Differential equations: Bernoulli's equation
- e. First order and Higher degree differential equation: Clairaut's equation
- f. Second order and First degree linear differential equations with constant coefficients
- g. Second order and First degree linear differential equations with variable coefficients: Cauchy's equations
- h. Applications in Engineering field

**Reference books:**

1. Erwin Kreyszig, "Advance Engineering Mathematics" , John Wiley and Sons Inc
2. Thomas, Finney, "Calculus and Analytical geometry" Addison- Wesley
3. M. B. Singh, B. C. Bajrachrya, "Differential Calculus", Sukunda Pustak Bhandar, Nepal
4. M. B. Singh, S. P. Shrestha, "Applied Mathematics"
5. G.D. Pant, G. S. Shrestha, "Integral Calculus and Differential Equations", Sunila Prakashan, Nepal
6. M. R. Joshi, "Analytical Geometry", Sukunda Pustak Bhandar, Nepal
7. S. P. Shrestha, H. D. Chaudhary, P. R. Pokharel,  
"A Textbook of Engineering Mathematics - Vol I"
8. Santosh Man Maskey, "Calculus", Ratna Pustak Bhandar, Nepal

**Evaluation Scheme:**

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks Distribution*
1	14	25
2	11	20
3	08	15
4	12	20
Total	45	80

**\*Note: There may be minor deviation in marks distribution.**