

2019 - 2020

SEMESTER-I

## 2.1 Differential and Integral Calculus

DSC-1A

BS:101

Theory: 5 credits and Tutorials: 0 credits  
Theory: 5 hours /week and Tutorials: 1 hours /week

**Objective:** The course is aimed at exposing the students to some basic notions in differential calculus.

**Outcome:** By the time students complete the course they realize wide ranging applications of the subject.

### Unit- I

**Partial Differentiation:** Introduction - Functions of two variables - Neighbourhood of a point  $(a, b)$  - Continuity of a Function of two variables, Continuity at a point - Limit of a Function of two variables - Partial Derivatives - Geometrical representation of a Function of two Variables - Homogeneous Functions.

### Unit- II

Theorem on Total Differentials - Composite Functions - Differentiation of Composite Functions - Implicit Functions - Equality of  $f_{xy}(a, b)$  and  $f_{yz}(a, b)$  - Taylor's theorem for a function of two Variables - Maxima and Minima of functions of two variables - Lagrange's Method of undetermined multipliers.

### Unit- III

**Curvature and Evolutes:** Introduction - Definition of Curvature - Radius of Curvature - Length of Arc as a Function, Derivative of arc - Radius of Curvature - Cartesian Equations - Newtonian Method - Centre of Curvature - Chord of Curvature.

**Evolutes:** Evolutes and Involutes - Properties of the evolute.

**Envelopes:** One Parameter Family of Curves - Consider the family of straight lines - Definition - Determination of Envelope.

### Unit- IV

**Lengths of Plane Curves:** Introduction - Expression for the lengths of curves  $y = f(x)$  - Expressions for the length of arcs  $x = f(y)$ ;  $x = f(t)$ ,  $y = \varphi(t)$ ;  $r = f(\theta)$

**Volumes and Surfaces of Revolution:** Introduction - Expression for the volume obtained by revolving about either axis - Expression for the volume obtained by revolving about any line - Area of the surface of the frustum of a cone - Expression for the surface of revolution - Pappus Theorems - Surface of revolution.

### Text:

- Shanti Narayan, P.K. Mittal *Differential Calculus*, S.CHAND, NEW DELHI
- Shanti Narayan *Integral Calculus*, S.CHAND, NEW DELHI

### References:

## Part B: Multiple integrals and Vector Calculus

### UNIT - III :

**Multiple integrals:** Introduction, The concept of a plane, Curve, Line integral- Sufficient condition for the existence of the integral. The area of a subset of  $R^2$ , Calculation of double integrals, Jordan curve, Area, Change of the order of integration.

#### *Prescribed book:*

A Course of Mathematical Analysis by Shanti Narayana and P.K.Mittal, S.Chand Publications. Chapter 16.1 to 16.8

### UNIT - IV:

Vector differentiation, Ordinary derivatives of vectors, Continuity, Differentiability, Gradient, Divergence, Curl operators, Formulae involving these operators. Vector integration, Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

#### *Prescribed text book:*

Vector Analysis by Murray.R.Spiegel, Schaum series publishing Company, Chapter 3,4,5,6 and 7.

#### *Reference Books:*

1. Text book of Vector Analysis by Shanti Narayana and P.K.Mittal, S.Chand and Company Ltd, New Delhi.
2. Mathematical Analysis by S.C.Mallik and Savitha Arora, Wiley Eastern Ltd.

2017-18

Paper IV (Elective - 1)

## NUMERICAL ANALYSIS

### UNIT - I :

**Errors in Numerical Computations:** Numbers and their Accuracy, Errors and their Computation, Absolute, Relative and Percentage errors, A general error formula, Error in a series approximation. **Solution of Algebraic and Transcendental Equations:** The bisection method, The iteration method, The method of false position, Newton-Raphson method, Generalized Newton-Raphson method, Ramanujan's method, Muller's method.