

Annexure-II

**Syllabus of Courses offered by the Department of
Mathematics for B.Sc. Physical Sciences CBCS I Year**

w.e.f. 2023-24

SEMESTER-I

Differential and Integral Calculus

(w.e.f. academic year 2023-24)

DSC-I

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-Neighborhood 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 $f_{yx}(a, b)$ - Taylor's theorem for a function of two Variables-Maxima and Minima of functions of two variables – Lagrange's Method of undetermined multipliers(subjected to one condition problems)

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 $x = f(y)$; $x = f(t)$, $y = \phi(t)$; $r = f(\theta)$

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:

- ❖ William Anthony Granville, Percy F Smith and William Raymond Longley; Elements of the differential and integral calculus
- ❖ Joseph Edwards, Differential calculus for beginners
- ❖ Smith and Minton, Calculus
- ❖ Elis Pine, How to Enjoy Calculus
- ❖ Hari Kishan, Differential Calculus

SEMESTER-II

Differential Equations

(w.e.f. academic year 2023-24)

DSC-II

BS:201

Theory: 5 credits and Tutorials: 0 credits

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

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit- I

Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential Equations - Simultaneous Total Differential Equations - Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$

Unit- II

Differential Equations first order but not of first degree: Equations Solvable for p -Equations Solvable for y -Equations Solvable for x -Equations that do not contain x or y -Equations Homogeneous in x and y - Equations of the First Degree in x and y -Clairaut's equation.

Applications of First Order Differential Equations: Growth and Decay -Dynamics of Tumor Growth-Radioactivity and Carbon Dating-Compound Interest-Orthogonal Trajectories.

Unit- III

Higher order Linear Differential Equations: Solution of homogeneous linear differential equations with constant coefficients-Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}, b \sin ax/b \cos ax, bx^k, Vx^k, Ve^{ax}$ - Method of undetermined coefficients.

Unit- IV

Method of variation of parameters-Linear differential equations with non-constant coefficients-The Cauchy-Euler Equation-Legendre's Linear Equations- Miscellaneous Differential Equations.

Partial Differential Equations: Formation and solution- Equations easily integrable-Linear equations of first order.

Text:

- ❖ Zafar Ahsan, Differential Equations and Their Applications

References:

- ❖ Frank Ayres Jr, Theory and Problems of Differential Equations.
- ❖ Ford, L.R; Differential Equations.
- ❖ Daniel Murray, Differential Equations.
- ❖ S. Balachandra Rao, Differential Equations with Applications and Programs.
- ❖ Stuart P Hastings, J Bryce McLead; Classical Methods in Ordinary Differential Equations.
- ∴ M.D. Raisinghanica, Ordinary and Partial Differential Equations.