| 20BSM101T | | | | | Calculus-I (Group A) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Teaching Scheme | | | | | Examination Scheme | | | | | |
| L | T | P | C | Hrs. / Week | Theory | | | Practical | | Total Marks |
| | | | | | MS | ES | IA | LW | LE/Viva | |
| 3 | 0 | 0 | 3 | 3 | 25 | 50 | 25 | -- | -- | 100 |

**COURSE OBJECTIVES**

- To make familiar the students to basic elements of calculus in sufficiently rigorous manner.
- To understand the concept of parametric representation.
- To perform basic operations on vector functions.
- To make aware of use of elementary calculus in curve tracing, finding volume, length of curves, surface area, etc.

**UNIT 1 DERIVATIVES OF A FUNCTION** **10 Hrs.**

Hyperbolic functions, Higher order derivatives, Applications of Leibnitz rule. The first derivative test, concavity and inflection points, Second derivative test, Curve sketching using first and second derivative test, limits at infinity, and graphs with asymptotes. Graphs with asymptotes, L'Hopital's rule, applications in business, economics and life sciences.

**UNIT 2 PARAMETRIC REPRESENTATION OF CURVE** **10 Hrs.**

Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates. Reduction formulae, derivations and illustrations of reduction formulae of the type.

**UNIT 3 APPLICATIONS OF CALCULUS** **10 Hrs.**

Volumes by slicing; disks and washers methods, Volumes by cylindrical shells. Arc length, arc length of parametric curves, Area of surface of revolution. Rotation of axes and second degree equations, classification into conics using the discriminant.

**UNIT 4 VECTOR FUNCTION** **10 Hrs.**

Introduction to vector functions and their graphs, operations with vector-valued functions, limits and continuity of vector functions, differentiation and integration of vector functions. Central force motion, Modeling ballistics and planetary motion, Kepler's second law, Curvature.

**40 Hrs.**

**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 – Apply calculus to calculate the volume, area etc. of one-dimensional object.
CO2 – Explain the properties of a graph of a function using derivatives.
CO3 – Analyze the applied problems using the concept of derivative.
CO4 – Analyze vector functions to find derivatives, tangent lines, integrals, arc length and curvature.
CO5 – Evaluate the derivative of a function.
CO6 – Evaluate a wide range of problems of mathematical applications using derivative or integral of vector function.

**TEXT/REFERENCE BOOKS**

1. J. Stewart, Essential Calculus-Early Transcendentals, 8nd ed., Cengage Learning, 2015.
2. H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and sons (Asia), Pvt. Ltd., 7th ed., Singapore, 2002.
3. F. Ayres and E. Mendelson, Schaum's outline of Calculus, 6th ed., McGraw-Hill Education, 2012.
4. T. M. Apostol, Calculus, volume I, 2nd ed., John Wiley and Sons, 1975.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

| **Max. Marks: 100** | **Exam Duration: 3 Hrs.** |
|---|---|
| Part A: 6 questions of 4 marks each | 24 Marks |
| Part B: 6 questions of 8 marks each | 48 Marks |
| Part C: 2 questions of 14 marks each | 28 Marks |