

**JYOTI NIVAS COLLEGE AUTONOMOUS  
SYLLABUS FOR 2018 BATCH AND THEREAFTER**

**Programme: B.Sc.**

**Semester: V**

**MATHEMATICS PAPER VI**

**Course Code: 18VMA6**

**No. of Hours: 45**

**COURSE OBJECTIVES:**

- Able to work independently and do in-depth study of various notions of mathematics.
- Seek to understand advances in various branches of mathematics.
- Able to explain the development of mathematics in its applications in other fields of sciences, economics and commerce
- Able to solve problems using mathematical methods and multiple integrals.

**LEARNING OUTCOMES:**

- **Apply the Calculus of Variation in the formulation of Geodesic problems on a plane and sphere and solving various problems using Euler's equation.**
- **Understand the concept of Line integral in space and evaluate the area, volume and mass of a solid through double and triple integral respectively.**
- **Apply the concepts in Integral Theorems – Green's, Divergence and Stokes theorem.**

**UNIT 1**

**CHAPTER 1 MATHEMATICAL METHODS II**

**15 HRS**

**Calculus of Variation:** Variation of a functional  $f = f(x, y, y')$  – extremal of a functional – variational problem – **Euler Lagrange equation** and its particular forms – Examples – standard problems like geodesics, minimal surface of revolution, hanging chain, Brachistochrone problem – Isoperimetric problems.

**UNIT 2**

**CHAPTER 1 LINE AND MULTIPLE INTEGRALS**

**20 HRS**

Definition of line integral and basic properties examples evaluation of line integrals. Definition of double integral – its conversion to iterated integrals. Evaluation of double integrals by change of order of integration and by change of variables – computation of plane and surface areas, volume underneath a surface and volume of revolution using double integrals. Definition of triple integral and evaluation – change of variables – volume as a triple integral.

## CHAPTER 2 INTEGRAL THEOREMS

10 HRS

Green's theorem - Direct consequences of the theorem. The Divergence theorem - Direct consequences of the theorem. The Stokes' theorem - Direct consequences of the theorem.

### PRACTICALS:

#### LIST OF PROBLEMS

1. Verify Euler's equation in full form.
2. Verify particular forms of Euler's equation.
3. Evaluation of the line integral with constant limits.
4. Evaluation of the double integral with constant limits.
5. Evaluation of the triple integral with constant limits.
6. Evaluation of the line integral with variable limits.
7. Evaluation of the double integral by changing the order of integration.
8. Evaluation of the triple integral with variable limits.
9. Verify Green's theorem.
10. Verify Gauss divergence theorem.
11. Verify Stokes' theorem

### REFERENCES:

1. B Spain, *Vector Analysis*, ELBS, 1994.
2. D E Bournesand, P C Kendall, *Vector Analysis*, ELBS, 1996.