

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

**Programme: B.Sc.**

**Semester: V**

**MATHEMATICS PAPER V**

**Course Code: 18VMA5**

**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 numerical analysis.

**LEARNING OUTCOMES:**

- Understand the concepts like integral domains, fields, ideals and quotient rings.
- Understand the concept of ring homomorphism and isomorphism and their consequences.
- Learn about various interpolating and extrapolating methods.
- Apply various numerical methods in real life problems.
- Apply the quadrature formula to solve definite integrals.
- Determine and apply, the important quantities associated with scalar fields, such as partial derivatives of all orders, the gradient vector and directional derivative.
- Determine and apply, the important quantities associated with vector fields such as the divergence, curl, and Laplacian.

**UNIT 1**

**CHAPTER 1 ALGEBRA V**

**15 HRS**

**Rings, Integral Domains, Fields**

Rings, Types of Rings properties of rings – Rings of integers modulo  $n$  – Subrings – Ideals ,Principal, Prime and Maximal ideals in a commutative ring – examples and standard properties following the definition – Homomorphism, Isomorphism – Properties – Quotient rings – Integral Domain- Fields - properties following the definition – Fundamental Theorem of Homomorphism of Rings - Every field is an integral domain – Every finite integral domain is a field .

**UNIT 2**

**CHAPTER 1 VECTOR DIFFERENTIAL CALCULUS**

**15 HRS**

**Differential Calculus of Scalar and Vector Fields:** Scalar field – gradient of a scalar field, geometrical meaning – directional derivative – Maximum directional derivative – Angle between two surfaces - vector field – divergence and curl of a vector field – solenoidal and irrotational fields – scalar and vector potentials – Laplacian of a scalar field – vector identities. Standard properties, Problems.

### UNIT 3

#### CHAPTER 1 NUMERICAL METHODS I

15 HRS

Finite differences – Definition and properties of  $\Delta$ ,  $\nabla$  and  $E$ , the relation between them – The  $n$ th differences of a polynomial. Newton –Gregory forward and backward interpolation formulae – Lagrange’s and Newton’s interpolation formulae for unequal intervals - Inverse interpolation. Numerical differentiation- Numerical Integration: Quadrature formula – deduce Trapezoidal rule -Simpson’s 1/3 and 3/8 rule and problems.

#### PRACTICALS:

##### LIST OF PROBLEMS

1. Verify different types of rings.
2. Verify integral domains
3. Verify fields.
4. Verify subrings, ideals and subrings which are not ideals.
5. Demonstrate the physical interpretation of gradient, divergence and curl.
6. Obtain gradient, divergence, curl and Laplacian in cylindrical coordinates.
7. Programs on Interpolations with equal intervals.
8. Programs on Interpolations with unequal intervals.
9. Programs to evaluate integrals using Simpson’s 1/3<sup>rd</sup> rule
10. Programs to evaluate integrals using Simpson’s 1/8<sup>th</sup> rule

#### REFERENCES:

1. B Spain, *Vector Analysis*, ELBS, 1994.
2. G B Thomas and R L Finney, *Calculus and analytical geometry*, Pearson Publications, 2006.
3. John B Fraleigh, *A First course in Abstract Algebra*, 3rd ed.: Narosa Publishing House., 2003.
4. R Balakrishnan and N.Ramabadran, *A Textbook of Modern Algebra*, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
5. S S Sastry, *Introductory methods of Numerical Analysis*, Prentice Hall of India, 2012.

6. Shanthi Narayan and P K Mittal, *Differential Calculus*, Reprint. New Delhi: S Chand and Co. Pvt. Ltd., 2014.

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