

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

**Programme: B.Sc.**

**Semester: III**

**MATHEMATICS PAPER III**

**Course Code: 18HIMA3**

**No. of Hours: 60**

**COURSE OBJECTIVES:**

- Capable of using appropriate software to determine the nature of sequence and series of real numbers.
- Able to understand real analysis and algebraic concepts of mathematics
- Able to work independently and do in-depth study of various notions of
- mathematics.

**LEARNING OUTCOMES:**

- Identify subgroup orders using Lagrange's theorem.
- Identify cyclic subgroups and their generators.
- Distinguish between the concepts of sequence and series, and determine limits of sequences and convergence and approximate sums of series.
- Explain Continuity and Discontinuity of various functions in different contexts and understand theorems associated with differentiability

**UNIT 1**

**CHAPTER 1 ALGEBRA III**

**15 HRS**

Groups Order of an element of a group – properties related to order of an element- subgroup generated by an element of a group –coset decomposition of a group, Cyclic groups- properties- modulo relation- index of a group –Lagrange's theorem- consequences.

**UNIT 2**

**CHAPTER 1 REAL ANALYSIS**

**30 HRS**

**Sequences of Real Numbers**

Definition of a sequence -Bounded sequences- limit of a sequence- convergent, divergent and oscillatory sequences- Monotonic sequences and their properties.

**Series of Real Numbers**

Definition of convergence, divergence and oscillation of series- properties of Convergence series- properties of series of positive terms – Geometric series, Tests for convergence of

series,  $p$ -series- comparison of series, Cauchy's root Test- D'Alembert's test. Raabe's test,- Absolute convergence- definitions and examples- Alternating series- Leibnitz test (statement only)– examples and problems.

### UNIT 3

#### CHAPTER 1 DIFFERENTIAL CALCULUS III

15 HRS

Definition of limit of a function in  $\epsilon$ - $\delta$  form – continuity- types of discontinuities. Properties of continuous function on a closed interval (boundedness, attainment of bounds and taking every value between bounds). Differentiability-Differentiability implies Continuity – Converse not true. Rolle's Theorem- Lagrange's and Cauchy's First Mean Value Theorem (Lagrange's form) – Taylor's Theorem - Maclaurin's expansion. Evaluation of limits by L'Hospital's rule.

#### PRACTICALS:

##### LIST OF PROBLEMS

1. Problems to Lagrange's theorem.
2. Problems for finding left and right cosets and finding the index of a group.
3. Illustration of convergent, divergent and oscillatory sequences.
4. Illustration of convergent, divergent and oscillatory series using.
5. Programs to illustrate continuity of a function.
6. Programs to illustrate differentiability of a function and unequal left hand and right hand limits for discontinuous functions.
7. Programs to Rolle's Theorem and Lagrange's Theorem.
8. Evaluation of limits by L'Hospital's rule.
9. Programs to expand using Taylor's series
10. Programs to expand using Maclaurin's series

#### REFERENCES:

1. E Spiegel, *Schaum's Outline of Advanced Calculus*, 2nd ed. USA: Mc. Graw Hill., 2001.
2. Frank Ayres and Elliott Mendelson, *Schaum's Outline of Calculus*, 5th ed. USA: Mc. Graw Hill., 2008.
3. G B Thomas and R L Finney, *Calculus and analytical geometry*, Pearson Publications 2006.
4. John B Fraleigh, *A First course in Abstract Algebra*, 3rd ed.: Narosa Publishing House., 2003.
5. N P Bali, *Differential Calculus*, New ed. New Delhi, India: Laxmi Publications (P) Ltd., 2010.

6. R Balakrishnan and N.Ramabadran, *A Textbook of Modern Algebra*, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991
7. Richard R Goldberg, *Methods of Real Analysis*, Indian ed. New Delhi, India: Oxford and IBH Publishing Co., 2012.
8. S Narayanan & T. K. Manicavachogam Pillay, *Calculus*: S. Viswanathan Pvt. Ltd., vol. I & II, 1996.