



RAICHUR UNIVERSITY, RAICHUR

Under Graduate Curriculum for Degree of Bachelor of Science (B.Sc) in

Mathematics (I & II Semester)

**As per Revised NEP 2024
With Effect from the Academic year from
2024-25 and onwards**

THEORY PAPER
SEMESTER-I
24MT-1: ALGEBRA – I AND CALCULUS – I

Course Learning Objectives:

- a) To understand the concept of matrices thoroughly with its role in solving system of equations.
- b) To understand the concept of binary operation, semigroups, Monoids and groups with examples.
- c) To understand the concept of successive differentiation, Limits and continuity.
- d) To understand the concept of mean value theorems.

Course Outcome: On successful completion of the course, the student will able to:

- a) Solve the system of linear equations; find the Eigen values and Eigen vectors of a square matrix.
- b) Differentiate – semi-groups, Monoids and groups with suitable examples and applications.
- c) Understand the importance of Rolle's theorem, Lagrange's theorem and Cauchy's mean value theorem.
- d) Use Leibnitz's rule to evaluate derivatives of higher order.
- e) Acquire basic principles of algebra and calculus.

UNITI: MATRICES

Elementary transformations; Row reduced Echelon form; Rank of a matrix; Inverse and Normal form of a matrix by elementary Operations; Solution of system of linear equations; Criteria for existence of trivial and non-trivial solutions of homogeneous and non-homogeneous system of linear equations; Eigen values and Eigen vectors of square matrices; Cayley- Hamilton theorem (without proof) and related problems.

UNITII: Group Theory - I

Binary operation on sets - properties, theorems and examples; Semigroup and Monoid - properties, theorems and examples; Definition of a Group - properties, theorems and examples; Order of a group; Modulo groups; Subgroups definition, Lagranges theorem (without proof) and its consequences, criteria for subgroups, intersection and union of subgroups.

UNITIII: SUCCESSIVE DIFFERENTIATION

Derivative of a function; Derivatives of higher order – nth derivatives of the functions : e^{ax} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax}\sin(bx + c)$, $e^{ax}\cos(bx + c)$ with problems; Leibnitz theorem (without proof) and its applications.

Limits, continuity and bounds of a function, Algebra of a continuous functions, Theorems on continuous functions (Every continuous function is bounded, Intermediate value theorem)

UNIT IV: DIFFERENTIABILITY OF FUNCTIONS

Differentiability of functions: Standard theorems (Every differentiable function is continuous but not conversely), Rolle's theorem - statement and problems; Lagrange's mean value theorem; Cauchy's mean value theorem with proof and examples. Taylor's theorem, Maclaurin's series and related examples. Indeterminate forms with examples.

Suggested References/Text books:

1. I N Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi.
2. Bernard & Child, Higher algebra, Arihant, ISBN: 9350943199/ 9789350943199.
3. Sharma and Vasishta, Modern Algebra, Krishna Prakashan Mandir, Meerut, U.P.
4. Shanti Narayan, P. K. Mittal, Differential Calculus, S. Chand & Company, New Delhi.
5. Vijay K Khanna and S K Bhambri, A Course in Abstract Algebra, Vikas Publications.
6. G K Ranganath, Text Book of B.Sc. Mathematics, S Chand & Company.
7. N.P. Bali. 9. Golden algebra. First Edition Edition - 1 January 2018.

PRACTICAL PAPER
SEMESTER-I
24MP-1:MATHEMATICS LAB-I

(4 hours/ week per batch of not more than 15 students)

Course Learning Objectives:

- a) Foundation for introducing to programming.
- b) Enables the student to explore mathematical concepts and verify mathematical facts through the use of software
- c) Enhances the skills in programming.
- d) Acquire knowledge of practical applications of algebra and calculus through FOSS.

Course Outcome: On successful completion of the course, the student will be able to:

- a) Learn Free and Open Source Software (FOSS) tools for computer programming.
- b) show proficiency in using the software C-Programming.
- c) understand the use of various techniques of the software for effectively doing mathematics.
- d) obtain necessary skills in programming.
- e) understand the applications of mathematics
- f) explore and grasp concepts for the future across a wealth of disciplines.

Syllabus: Problems from 24MT 1 (Theory) may be solved with the help of programming.

Suggested Softwares: Maxima/Scilab/Python.

List of Programs (Suggested):

- 1. Introduction to Scilab and Maxima with basic commands.
- 2. Algebra of Matrices. (Addition, subtraction, Multiplication, Transpose of a Matrix).
- 3. Computation of Rank of matrix and Row reduced Echelon form and Normal form of a matrix.
- 4. Solving the system of homogeneous and non-homogeneous linear algebraic equations.
- 5. Finding the Eigen Values and Eigen Vectors of a matrix.
- 6. Computation of Inverse of a Matrix using Cayley-Hamilton theorem.
- 7. Verification of binary operations.
- 8. Verification of Commutative and Associative Laws.
- 9. Find the identity element and inverse of an element.
- 10. Finding the nth derivative using Leibnitz rule.
- 11. Verification of Cauchy's mean value theorem.
- 12. Verification of Lagrange's mean value theorem.
- 13. Problems on Taylor's and Maclaurin's series.
- 14. Evaluation of limits using L-Hospital rule.