

MORIGAON COLLEGE (AUTONOMOUS)

MORIGAON, ASSAM



SYLLABUS

Major & Minor

(Semester – 1 & Semester – 2)

**Four Years Under Graduate Programme (FYUGP) in
Mathematics**

Under National Education Policy (NEP) 2020

DEPARTMENT: MATHEMATICS

SEMESTER – 1

Course Name: Foundations and Algebra
Course Code: MAT-CORE-(MJ/MN)-MC-0100104
Nature of the Course: Major & Minor
Total Credit: 4
Total Marks: 100 (External 60, Internal 40)
No. of classes: 60

Prerequisites: Mathematics in 10+2 or equivalent standard.

Course Objectives: The primary objective of this course is to introduce students to the foundational concepts of mathematical logic and proof techniques, set theory, functions, theory of equations, complex numbers, and matrix analysis including solutions of systems of linear equations by matrix method.

Course Learning Outcomes: This course will enable the students to:

1. Understand and apply the principles of mathematical logic, and use set-theoretic concepts and operations effectively.
2. Apply Descartes' rule of signs to find the nature of the roots of a given polynomial equation, and establish relationships between roots and coefficients of polynomial equations.
3. Apply methods such as Cardan's solution of cubic equations and Euler's method for biquadratic equations.
4. Apply De Moivre's theorem in a number of applications, understand and use exponential, logarithmic, and hyperbolic functions of complex numbers, and apply series expansions such as Gregory's series for evaluating mathematical constants.
5. Analyse the consistency and solution structure of homogeneous and non-homogeneous systems of linear equations by applying matrix methods.

UNIT 1: Statements and logic: statements, statements with quantifiers, compound statements, implications, proofs in Mathematics; Sets: basic terminologies, operations on sets, family of sets, power sets, cartesian products of sets; Functions: basic definitions, one-one, onto functions and bijections, composition of functions, inverse of a function, image and inverse image of subsets.

[1] Chapters 1 – 3

(No. of classes: 10, Marks: 10)

UNIT 2: Theory of equations: Algebraic equations, deductions from Fundamental Theorem of Classical Algebra, Descartes' rule of signs, relation between roots and coefficients of a polynomial equation of degree n , symmetric functions of roots, transformation of equations, Cardan's method of solution of a cubic equation, Euler's method of solution of a biquadratic equation.

[2] Chapter 5 (Theorem 5.1.1, Theorem 5.2.1, Sections 5.3 - 5.6, 5.11, 5.12)

(No. of classes: 15, Marks: 15)

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UNIT 3: Polar representation of complex number, De Moivre's theorem (both integral and rational index), Roots of complex numbers, n th roots of unity, Application of De Moivre's Theorem, Exponential and logarithmic functions of complex numbers, Hyperbolic functions, Gregory's series and evaluation of π , Summation of trigonometric series.

[2] Chapter 2 (Sections 2.7-2.13, 2.16, 2.18)

[3] Chapters 10, 11

(No. of classes: 20, Marks: 20)

UNIT 4: Elementary operations on a matrix, matrix inversion and properties, systems of Linear Equations, row reduction and echelon forms, rank of a matrix, the matrix equation $Ax = b$, consistency of linear systems, solutions of systems of homogeneous and nonhomogeneous linear equations, types of matrices, partitioned matrix.

[4] Chapter 1 (Sections 1.1, 1.2, 1.4, 2.2, 2.4)

[5] Chapter 2 (Sections 2.3, 2.4, 2.5)

(No. of classes: 15, Marks: 15)

Text Books:

1. A. Kumar, S. Kumaresan and B. K. Sarma, A Foundation Course in Mathematics, Narosa, 2018.
2. S. K. Mapa, Higher Algebra (Classical), Revised 9th Edition, 2021, Levant Books.
3. B. C. Das and B. N. Mukherjee, Higher Trigonometry, U. N. Dhar & Sons Pvt Ltd.
4. David C. Lay, Linear Algebra and its Applications (3rd Edition), Pearson Education Asia, Indian Reprint, 2007.
5. Carl D. Meyer (2000). Matrix Analysis and Applied Linear Algebra. Society for Industrial and Applied Mathematics (Siam).

Reference Books:

1. Dickson, Leonard Eugene (2009). First Course in The Theory of Equations. The Project Gutenberg eBook (<http://www.gutenberg.org/ebooks/29785>)
2. Gilbert, William J., & Vanstone, Scott A. (1993). Classical Algebra (3rd ed.). Waterloo Mathematics Foundation, Canada.
3. Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser, 2006.

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SYLLABUS

Skill Enhancement Course

(Semester – 1 & Semester – 2)

**Four Years Under Graduate Programme (FYUGP) in
Mathematics**

Under National Education Policy (NEP) 2020

DEPARTMENT: MATHEMATICS

SEMESTER – 1

Course Name: Programming in C
Course Code: SEC-MAT-MC-0100103
Nature of the Course: Skill Enhancement Course
Total Credit: 3 (2L+1P)
Total Marks: 75 (External 30, Internal 20, Practical 25)
No. of classes: 45

Course Objectives: The course aims to introduce students to the fundamentals of computer programming using the C language, enabling them to develop algorithmic thinking and problem-solving skills through algorithms, flowcharts, control structures, arrays, and functions. By the end of the course, students will be able to write structured, efficient and error-free C programs to solve basic computational problems and prepare themselves for more advanced courses in computer science.

Course Learning Outcomes: This course will enable the students to:

1. Understand the fundamental concepts of programming and problem-solving approaches by developing algorithms and flowcharts.
2. Explain the fundamental structure and syntax of the C programming language.
3. Apply conditional and loop control structures to implement decision-making and repetitive tasks.
4. Use one-dimensional and two-dimensional arrays for data storage and manipulations.
5. Develop modular programs using user-defined functions, including recursive functions, and demonstrate the use of function arguments and return values.

UNIT 1: Algorithm and Flowchart; Fundamentals of C Language: Characters in C, Identifier, Keywords, Tokens, Constants, Variables, Data types, Operators and expressions, Hierarchy of operations, Mixed mode operation and automatic (implicit) conversion, Explicit conversion, Library functions, Structure of a C program, Input/Output Functions and statements.

(No. of classes: 10)

UNIT 2: Control Statements in C: if-else statement (including nested if-else statement), switch statement; Loop control Structures in C: for loop, nested for loop, while loop, do-while loop; goto, break, and continue statement, exit function.

(No. of classes: 10)

UNIT 3: Arrays and subscripted variables: One-dimensional array, Two-dimensional array, Array declaration, accessing values in an array, initializing values in an array, sorting of numbers in an array, addition and multiplication of matrices with the help of array. Functions: function declaration, calling a function, actual and formal arguments, function prototype, recursive function.

(No. of classes: 10)

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Programs for practical:

1. Value of a piecewise defined function (single variable).
2. To find the roots of a quadratic equation
3. To find the factorial of a given positive integer
4. Sum of different algebraic series
5. To find the sum of the digits of a given positive integer
6. To reverse a given integer
7. To check whether a given number is prime or not.
8. To generate the Fibonacci series.
9. To generate the multiplication table.
10. Sorting of numbers in an array
11. To find addition, subtraction and multiplication of matrices.
12. To find $\sin(x)$, $\cos(x)$ with the help of functions.

(No. of classes: 15)

Text Book:

1. T. Jeyapooan, A First Course in Programming with C, Vikash Publishing House Pvt Ltd.

Reference Books:

1. E. Balagurusamy, Programming in ANSI C, McGraw Hill Education.
2. Y. Kanetkar, Let us C, B.P.B. Publication.

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