DEPARTMENT OF MATHEMATICS

B N COLLEGE (AUTONOMOUS), DHUBRI, ASSAM

Name of the Department: Mathematics
Semester: I
Name of the Paper: Introductory Mathematics-I
Paper Code: MAT-DSC-141
Credit: 4 Hours: 60
Lecture: 3 Practical: 0 Tutorial: 1
Full Marks: 100

Course Outcome: The course will enable the students to:

1. Analyze and construct logical expressions using statements, quantifiers, truth tables, and logical equivalence.
2. Understand and work with sets, relations, and functions including its graphical representations and types to solve related problems.
3. Understand the fundamentals of matrices, including their arithmetic, special types, determinants and elementary row operations.
4. Evaluate the inverse and rank of matrices and apply these concepts to solve systems of linear equations using various methods.
5. Understand complex numbers and their polar representation. Apply De Moivre's theorem and explore its applications, including finding the nth roots of unity.

Main Syllabus:

Unit No.	Syllabus	Class Hour	Allotted Marks
I. Mathematical statements and logic	Statements and logic, Statement quantifiers, Compound statements, Truth Tables, Logical Equivalence, Algebra of Statements, Standard techniques of Proof, Sets, Relations and its types, Equivalence class, Partition of Set, Functions, Graphical representations, One-one and onto functions, Invertible functions, Composition of functions, Algebra of functions. [1], Chapter 1,2,3.	15	25

II. Matrix and system of linear equations	Introduction to Matrix, Arithmetic of matrices, special type of matrices, Row Reduction, Echelon form, Determinant of a Matrix, Elementary Transformations, Inverse of a matrix, Rank of a Matrix, Solution of a system of Linear Equations. [3] Chapter 1 (Section 1.2,1.4 and 1.5). [3] Chapter 2 (Section 2.1, 2.2 and 2.3). [3] Chapter 3.	30	50
III. Algebra of complex numbers	Introduction to complex numbers, Polar representation a complex number, De Moivre's theorem and its application, n^{th} roots of unity, Trigonometric Functions, Inverse functions, Exponential, Logarithmic and Hyperbolic Function. [2] Chapter 1 (Section 1.4). [2] Chapter 2 (Section 2.1, 2.2 and 2.5). [2] Chapter 4 (Section 4.1).	15	25

Text Books:

1. A Kumar, S. Kumaresan and B. K. Sarma, *A Foundation Course in Mathematics*, Narosa, 2018.
2. Dennis G. Zill, Patrick D. Shanahan, *A first course in complex analysis with applications*, Jones and Bartlette Student Edition, Third Edition, 2015.
3. David C. Lay, *Linear Algebra and its aplications*, 2nd Edition.

Reference Books:

1. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra*, FifthEdition, Pearson Publication, 2022.
2. Gilbert Strang, *Linear Algebra and its Applications*, Thomson, 2007.
3. Titu Andreescu and Dorin Andrica, *Complex Numbers from A to Z*, Birkhauser, 2006.

Name of the Department: Mathematics
Semester: I
Name of the Paper: Introduction to Mathematica
Paper Code: MAT-SEC-131
Credit: 3 (Theory-2, Pratical-1) Hours: 60 (Theory-30+Practical-30)
Lecture: 2 Practical: 1 Tutorial: 0
Full Marks: 75 (Theory-50, Practical-25)

Course Outcome: The students will enable the students to

1. Understand the basic syntax and working commands of the computer algebra system software Mathematica and use it as a calculator, for plotting functions, animations and other such applications.
2. Apply Mathematica for various operations of matrices to solve system of linear equations.

Main Syllabus:

Unit No.	Syllabus	Class Hour	Allotted Marks
I. **Introduction to Mathematica**	Launching Mathematica, Basic rules of Mathematica, Applications in algebraic calculations, Computing and plotting functions in 2D, Plotting functions of two variables in 3D and Contour Plot, Plotting parametric curves surfaces, Customizing plots, Animating plots, Producing tables of values, Working with piecewise defined functions, Combining graphics. [1] Chapter 1,2 and 3(3.1-3.8).	15	25
II. Basic Linear Algebra using Mathematica	Working with matrices, Performing basic matrix arithmetic, Gauss elimination, operations (transpose, determinant, inverse), Minors and cofactors, Solving system of linear equations. [1] Chapter 7 (7.1-7.6)	15	25
III. Practical	Six practical works (Three from each of the above units)	30	25

Text Books:

1. Torrence, Bruce F., & Torrence, Eve A. (2009). The Student's Introduction to Mathematica: A Handbook for Pre-calculus, Calculus and Linear Algebra (2nd ed.). Cambridge University Press.

Reference books:

1. Bindner, Donald & Erickson, Martin. (2011). A Student's Guide to the Study, Practice, and Tools of Modern Mathematics. CRC Press, Taylor & Francis Group, LLC.

Name of the Department: Mathematics
Semester: I
Name of the Paper: Introduction to Algebra
Paper Code: MAT-MDC-131
Credit: 3 Hours: 45
Lecture: 2 Practical: 0 Tutorial: 1
Full Marks: 75

Course Outcome: This course will enable the students to

1. Remember the basic terminologies and results in basic set theory including relations and functions of sets and its types.
2. Understand the various types of trigonometric functions and its applications.
3. Apply matrix algebra to solve systems of linear equations.

Main Syllabus:

Unit No.	Syllabus	Class Hour	Allotted Marks
1.	Sets, basic properties of sets, relation and different types of relation, function and their types, binary operations with their properties. [1] Chapter 1, 2.	15	25
2.	Basic trigonometry with their properties, measurement of different types of angles, inverse trigonometric functions, Solutions of trigonometric equations. [1] Chapter 3.	15	25
3.	Matrices, different types of matrices, Algebra of matrices, Adjoint, Minor, cofactor and inverse of a matrix, Determinant of a matrix and its applications. [2] Chapter 3, 4.	15	25

Textbooks:

1. Mathematics, Textbook for class 11, NCERT.
2. Mathematics, Textbook for class 12, NCERT.

Reference Books:

1. A. Kumar, S. Kumaresan and B.K. Sarma, *A foundation course in mathematics, Narosa*, 2018.
2. David C. Lay, *Linear Algebra and its application* (3rd edition), Pearson Education Asia, Indian Reprint, 2007.
3. Ted Sundstorm, Steven Schlicker, *Trigonometry*, Grand Valley state University.

Name of the Department: Mathematics
Semester: II
Name of the Paper: Introductory Mathematics-II
Paper Code: MAT-DSC-142
Credit: 4 Hours: 60
Lecture: 3 Practical: 0 Tutorial: 1
Full Marks: 100

Course Outcome: The course will enable the students to:

1. Understand and remember the basic principles of mathematics such as the well ordering property, mathematical induction and classify sets based on cardinality.
2. Apply mathematical induction in proving statements for natural numbers.
3. Understand and apply the fundamental theorem of classical algebra and explore the relationship between the roots and coefficients of a polynomial equation.
4. Apply the pigeonhole principle, sum and product rule, and permutation and combination to solve basic counting problems.

Main Syllabus:

Unit No.	Syllabus	Class Hour	Allotted Marks
I. Fundamental principles of set theory	Mathematical Induction Principle, The strong induction principle, Well ordering property, Cardinality of sets, Schroder-Bernstein Theorem, Finite sets, Countable and Uncountable sets. [1] Chapter 5& 6.	15	25
II. Classical Algebra	Algebraic equations, Basic inequalities, 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, Cardon's method of solution of a cubic equation, Euler's Method of solution of a biquadratic equation. [2] Chapter 5 (Section 5.1, 5.2, 5.3-5.6, 5.11, 5.12).	30	50

III. Combinatorics	Pigeonhole Principle, Basic sum and product rule of counting, Permutation and combination, Binomial coefficients and identities, Generalized permutation and combination. [3] Chapter 6 (Section 6.1-6.5).	15	25

Text books:

1. A Kumar, S. Kumaresan and B. K. Sarma, *A Foundation Course in Mathematics*, Narosa, 2018.
2. S.K. Mappa, *Higher Algebra (Classical)*, Revised 9th Edition, 2011.
3. Kenneth H. Rosen, *Discrete Mathematics and its applications*, 8th Edition, McGraw Hill Education, 2021.

Reference books:

1. Gilbert, William J. & Vanstone, Scott A., *Classical Algebra*, 3rd Edition, Waterloo Mathematics Foundations, Canada, 1993.

2. C.L. Liu and D.P. Mohapatra, *Elements of Discrete Mathematics*, 4th Edition, McGraw Hill Education, 2017.

Name of the Department: Mathematics
Semester: First Semester
Name of the Paper: Introduction to LaTeX
Paper Code: MAT-SEC-132
Credit: 3 (Theory-2, Practical-1) Hours: 60 (Theory-30+Practical-30)
Lecture: 2 Practical: 1 Tutorial:0
Full Marks: 75 (Theory-50, Practical-25)

Course Outcome: The student will be able to

1. Understand the procedure to design well-structured documents, including research papers, reports, and presentations with mathematical notations using LaTeX.
2. Apply LaTeX's advanced functionalities such as mathematical notation, tables, graphics, and references for academic and professional use.

Main Syllabus:

Unit No.	Syllabus	Class Hour	Allotted Marks
I. Introduction to Latex	Basic elements of LaTeX, Installation, Basic document class and structure, Packages, Fonts, styles and sizes, Special characters and symbols, Enumerated and itemized lists, Mathematical notations. [1] Chapter 1,2,3,5.	15	25
II. Figures, Graphics and Presentations	Including images in documents, Positioning and scaling images, Adding bibliographies with BibTeX and BibLaTeX, Cross-references for figures, tables, and sections. [1] Chapter 4,6,9.	15	25
III. Practical	Six practical work (Three from each of the above units)	30	25

Text Books:

1. Helmut Kopka and Patrick W. Daly, "*A Guide to LaTeX"* (4th Edition).

Reference Books:

1. L. Lamport, LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley. New York, second edition, 1994,

Name of the Department: Mathematics
Semester: II
Name of the Paper: Introduction to Calculus and Statistics
Paper Code: MAT-MDC-132
Credit: 3 Hours: 45
Lecture: 2 Practical: 0 Tutorial: 1
Full Marks: 75

Course Outcome: This course will enable the students to

1. Understand the concept of limit, continuity and differentiability of functions.
2. Understand integration and the various techniques of integration.
3. Understand basic ideas of statistics such as Mean deviation, variance and standard deviation.
4. Apply derivative and integration of functions in solving various problems.

Main Syllabus:

Unit No.	Syllabus	Class Hour	Allotted Marks
1.Differential Calculus	Limit, Continuity, Differentiability, Logarithmic Differentiation, Derivatives of Functions in Parametric Forms, Second Order Derivative. [2] Chapter 5.	15	25
2. Integral calculus.	Integration as an Inverse Process of Differentiation, Methods of Integration, Integrals of Some Particular Functions , Integration by Partial Fractions, Integration by Parts, Definite Integral. [2] Chapter 7 (7.1-7.7).	15	25
3.Introduction to Statistics	Measures of Dispersion, Range, Mean deviation, Variance and Standard Deviation. [1] Chapter 13.	15	25

Textbooks:

1. Howard Anton & Stephens Davis, *Calculus,* 10ed, Wiley, 2015.
2. S.C. Gupta & V.K. Kapoor, *Fundamentals of Mathematical Statistics (A Modern Approach),* SULTAN CHAND & SONS, 2002.

Reference Books:

1. Przemyslaw Bogacki, Maurice D. Weir, Joel Hass and Christopher Heil, *Thomas' Calculus,* 15th Edition, Pearson Publications, 2024.