GIRIJANANDA CHOWDHURY UNIVERSITY

Hathkhowapara, Azara, Guwahati-781017, Assam

CORE COURSES OFFERED BY DEPT. OF MATHEMATICS

BMA23103T	ALGEBRA AND CALCULUS-II	L	T	P	C
		3	1	0	4

Pre-requisite: Knowledge of Mathematics at Class XI & XII

Course Objectives:

- To demonstrate the techniques to solve polynomial equations of higher degree
- To calculate and interpret geometrically triple product of vectors and to form equations ofstraight line, plane, sphere in vector form
- To learn techniques for. producing a rough idea of overall shape of different curves
- To apply integrals in physical problems

Course Outcome:

After successful completion of the course, the students will be able to

CO 1: demonstrate the graphical representation of a polynomial, maximum and minimum values of a polynomial, acquire the concept of symmetric functions.

CO 2: explain the equation of straight lines, planes in vector form.

CO 3: illustrate tracing of curves for Cartesian, parametric and polar functions

CO 4: explain the relationships between Beta and Gamma functions and their roles in calculus.

CO5: apply the knowledge of integration in finding areas and volumes of surfaces of revolution.

Module 1: Theory of Equations — **20 Hours**

General properties of polynomials, Graphical representation of a polynomials, maximum and minimum values of a polynomials, General properties of equations, Descartes' rule of signs positive and negative rule, Relation between the roots and the coefficients of equations. Symmetric functions, Applications symmetric function of the roots, Transformation of equations. Solutions of reciprocal and binomial equations. Algebraic solutions of the cubic and biquadratic. Properties of the derived functions.

Module 2: Vector Algebra — **10 Hours**

Triple product of vectors, Vector four product and their properties, Reciprocal system of vectors, Vector equation of straight line, plane and sphere.

Module 3: Tracing of Curves — **10 Hours**

Concavity and inflection points, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves.

Module 4: Integral Calculus — **20 Hours**

Reduction formulae, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Multiple integrals, Arc length of parametric curves, Application of definite integrals to evaluate surface areas and volume of solids of revolution.

Total Lecture hours — **60 hours**

Text Book(s)

1. Dickson, L. E., First Course in the Theory of Equations. John Wiley & Sons, Inc. NewYork. The Project Gutenberg **EBook** (1922)
2. Thomas G.B. and Finney R.L., Calculus, 9th Ed., Pearson Education, Delhi (2014)
3. Spiegel M. R., Schaum's outlines Vector Analysis, Tata McGraw Hill (Education) India Pvt. Ltd, New Delhi (2009)
4. Bartle Robert G., Sherbert Donald R., Introduction to Real Analysis, John Wiley & Sons, Inc. NewYork (2000)

Reference Books

1. Strauss M. J., Bradley G. L. and Smith, K. J. Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, (2007).
2. Narayan S., Mittal P. K,, A Text Book Of Vector Analysis, S. Chand Publishing, Uttar Pradesh (1955)
3. Das B. C.& Mukherjee B. N., Integral Calculus, U. N. Dhur and Sons Pvt. Ltd, Kolkata (2014)

CORE COURSES OFFERED BY DEPT. OF MATHEMATICS

BMA23104T	COMPLEX ANALYSIS	L	T	P	C
		3	1	0	4

Pre-requisite: Knowledge of Mathematics at Class XI & XII

Course Objectives:

- To study the techniques of complex variables and functions together with their derivatives.
- To investigate theorems in Complex Integrals.

Course Outcome:

After successful completion of the course, the students will be able to

CO 1: understand limit, continuity and differentiation of functions of complex variables
CO 2: understand Cauchy-Riemann equations
CO 3: apply various properties of Cauchy-Riemann equations to analytic functions
CO4: understand integral formulae and apply to evaluate complex contour integrals
CO 5: expand functions as Taylor and Laurent series and the convergence of power series

Module 1: Complex Differentiation and Cauchy Riemann Equation — **30 Hours**

Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings. Limits, continuity, Derivative of a complex function, Differentiation formulae, Analytic function, Elementary analytic functions (exponential, trigonometric, logarithm), Cauchy-Riemann equations, Sufficient conditions for differentiability, Harmonic functions, Milne-Thompson method.

Module 2: Complex Integration and Cauchy's Theorem — **30 Hours**

Complex Line integral, Real line integral, Simply and Multiply connected regions. Green's theorem in the plane (Complex form), Cauchy's theorem, Cauchy – Goursat theorem, Morera's theorem, consequences of Cauchy's theorem, Cauchy's integral formulae, Liouville's theorem and the fundamental theorem of algebra. Convergence of sequences and series, Taylor series and its examples. Laurent series and its examples, absolute and uniform convergence of power series.

Total Lecture hours — **60 hours**

Text Book(s)

1. Speigel M.R., Schaum Outline Complex Variables, McGraw Hill Companies Inc.(2009)

Reference Books

1. Brown J. W. and Churchill R. V., Complex Variables and Applications (Eighth Edition), McGraw – Hill International Edition, (2009)

MULTIDISCIPLINARY COURSES (MDC) OFFERED BY DEPT. OF MATHEMATICS

BMA23142T	Combinatorics, Partial Fractions and Measures of Central Tendency	L	T	P	C
		3	0	0	3

Pre-requisite: Knowledge of Mathematics at high school

Course Objectives:

- To motivate students towards intrinsic interest in statistical thinking
- To apply the Fundamental principle of counting to find out the total number of outcomes in problem
- To enable students to split the fractions into numerous sub fractions.

Course Outcome:

After successful completion of the course, the students will be able to

CO1: demonstrate the applications of permutation and combination.

CO2: illustrate Proper and Improper fractions, Partial fractions.

CO3: demonstrate Measures of Central Tendencies, their Advantages and disadvantages.

Module 1: Measures of Central Tendency	**15 Hours**
Measures of Central Tendency: Mean, Median and Mode	
Module 2: Combinatorics and recurrence relations	**15 Hours**
Permutations, Combinations, permutations with repetitions, combinations with repetitions, recurrence relations and their solutions	
Module 3: Partial Fraction	**15 Hours**
Polynomial, Rational Fraction, Proper and Improper fractions, Partial fractions, resolving into partial fractions	
Total Lecture Hours	**45 hours**

Text Book(s)

1. Barnard S., Child J.M, Higher Algebra (Ebook), Macmillan & Co Ltd (1959)

Reference Book(s)

1. Hall H. S., Night S. R., Higher Algebra, Arihant Publications Ltd, Meerut (2016)