

Lesson Plan for Course: B.Sc (G) Sem-I Code: MA-1 Marks: 100 Credit: 5

- Course Name: Algebra
- Course coordinator: Dr. Pintu Debnath
- Course Outcomes:
 - CO-1. Learn ϵ and δ definition of limit and continuity of a real-valued function.
 - CO-2. Apply Leibnitz's theorem to derive successive differentiation.
 - CO-3. Concept of Euler's theorem on homogeneous function.
 - CO-4. Able to find out tangents, normals, curvature, asymptotes, singular points of any curves.
 - CO-5. Understand Rolle's theorem and Mean Value theorems and their applications.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Aug	Unit-1: Relation between roots and coefficients, Transformation of equation, Equation of squared differences of a cubic, Descartes' rule of signs, Upper bounds for the real roots; Cardan's solution of the cubic and the nature of the roots of the cubic, Ferrari's methods of solution of biquadratic equations.	BS	07	Theoretical – 06 Tutorial - 01
	Unit-1: De-Moivre's theorem for integer and rational indices and their applications, The n-th roots of unity. Definitions of exponential and trigonometrical functions of a complex variable, Logarithm of a complex number and its properties.	SM	05	Theoretical – 04 Tutorial - 01
	Unit-1: The inequality involving $AM \geq GM \geq HM$, Extreme values of sum and product, theorem of weighted means, Cauchy's inequalities, m -th power theorem. Unit-2: Equivalence relations and partitions, Functions, Composition of functions, Invertible functions, One to one correspondence and cardinality of a set. Permutations, inversions, cycles and transpositions.	PD	04	Theoretical – 03 Tutorial - 01
Sept	Unit-1: Reciprocal equations, Binomial equations and their properties.	BS	03	Theoretical – 02 Tutorial - 01
	Unit-1: Definitions of a^z , Inverse circular functions, hyperbolic functions.	SM	02	Theoretical – 01 Tutorial - 01
	Unit-2: Definition and examples of groups, examples of abelian and nonabelian groups, the group Z_n of integers under addition modulo n and the group $U(n)$ of units under multiplication modulo n , groups of symmetries of an equilateral triangle, the permutation group S_3 , the general linear group $GL(n, R), n \leq 3$.	PD	04	Theoretical – 02 Tutorial - 02

1st Internal Assessment					
Oct	Unit-3: Matrix of real and complex numbers, Algebra of matrices (structure only); symmetric and skew symmetric matrices, Hermitian and skew Hermitian matrices; Orthogonal and Unitary matrices. Determinants, Laplace expansions, cofactors, adjoint, inverse of a matrix, Cramer's Rule.	BS	05	Theoretical – 05 Tutorial - 00	
	Unit-3: Vector space, Linearly dependent and independent set, Basis, Dimension, Linear Transformation and their elementary properties and examples.	SM	03	Theoretical – 02 Tutorial - 01	
	Unit-2: Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset, Cosets, Index of subgroup, Lagrange's theorem and its converse, order of an element, Normal subgroups: their definition, examples, and characterizations.	PD	03	Theoretical – 02 Tutorial - 01	
Nov	Unit-3: Eigenvalues, Eigenvectors, Eigenspace, Diagonalization of matrices.	BS	03	Theoretical – 02 Tutorial - 01	
	Unit-3: Matrix representation of Linear Transformation, Rank of a matrix; Determination of rank (relevant results are to be stated only).	SM	03	Theoretical – 02 Tutorial - 01	
	Unit-2: Definition and examples of rings, examples of commutative and non-commutative rings, Z_n , the ring of integers modulo n , polynomial rings.	PD	03	Theoretical – 02 Tutorial - 01	
Dec	Unit-3: Characteristic polynomial of a matrix, Cayley-Hamilton theorem and its application for determining inverse of square matrix. Bilinear forms, real quadratic forms Sylvester's law of inertia, positive definiteness.	BS	05	Theoretical – 04 Tutorial - 01	
	Unit-3: System of linear equations in matrix form $AX = B$; Consistency and inconsistency (by rank method); Types and determination of solution (by using notion of rank), Solving linear systems using Gaussian elimination.	SM	04	Theoretical – 02 Tutorial - 02	
	Unit-2: Definitions of Subrings, Integral domains, skew-fields, fields and subfields, their examples and elementary properties.	PD	03	Theoretical – 03 Tutorial - 00	
	2 nd Internal Assessment				
	Revision		BS	02	Theoretical – 04 Tutorial - 00
			SM	01	
		PD	01		
End Semester Examination					
Assessment: Internal Assessment & Assignment			Total: 61 Hrs	Theoretical – 46 Tutorial - 15	

Books:

- Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser, 2006.
- Dickson, Leonard Eugene (2009), First Course in the Theory of Equations, John Wiley & Sons, Inc. The Project Gutenberg eBook: <http://www.gutenberg.org/ebooks/29785> 3
- W.S. Burnstine and A.W. Panton, Theory of equations, Vol. 1. Fourteenth Edition, S. Chand and Co Ltd, New Delhi.
- S. Barnard and J.M. Child, Higher Algebra, Surjeet Pbl., New Delhi, 1990.
- Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2005.
- Joseph A. Gallian, Contemporary Abstract Algebra, 4th Ed., 1999.
- John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
- David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
- K.B. Dutta, Matrix and linear algebra.
- K. Hoffman, R. Kunze, Linear algebra.
- S. K. MAPA, Classical Algebra, Sarat Book Distributor, India, 2019.
- S. K. MAPA, Higher Algebra, Sarat Book Distributor, India, 2019.
- H. Anton, I. Birens and S. Davis, *Calculus*, John Wiley and Sons, Inc., 2002.