B.Sc. (Mathematics) (Part III) (Semester – V)
Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course code	:	DSE – E10
Title of course	:	Modern Algebra
Theory	:	32 Hrs. (40 lecturers of 48 min.)
Marks	:	50 (Credit: 02)

Course Outcomes: Upon successful completion of this course, the student will be able to:

CO 1. learn Group structure and its properties.
CO 2. learn Ring structure and its properties.
CO 3. describe the difference between concepts Group and Ring.
CO 4. understand fundamental theorem of homomorphism, isomorphism for Group and Ring.

Unit 1: Groups **(20 Lect.)**

Groups: Definition and examples of groups, commutative group, order of a group, Quaternion group, group of residues, Definition of subgroup and examples, Definition of centre of group G ,Normalizer of an element in G, Definition of left and right cosets and congruence relation, Lagrange's Theorem, Definition of Index of H in G,Centralizer of H, Normalizer of H, Definition of cyclic group and order of element of a group, Definition of Euler's $\emptyset$ function, Euler's Theorem, Fermat's Theorem, Examples related to Euler's $\emptyset$ function and Fermat's Theorem.

Unit-2 Normal Subgroups, Homomorphism of Groups, Ring and it's properties **(20 Lect.)**

Definition and examples of subgroup, simple group , quotient group, Definition the Normalizer N(H), Definition and examples of Homomorphism, Isomorphism, epimorphism, Monomorphism, Endomorphism and Automorphism, Fundamental Theorem of group homomorphism, Second Theorem of isomorphism, Third Theorem of isomorphism, Dihedral group, Permutation group, Cayley's Theorem, Definition of Alternating group, Definition and examples of a ring, Commutative ring, Ring with unity, Definition and examples of Zero divisor, Integral Domain, Division Ring, Field, Definition and examples of Boolean ring, Definition and examples of Subring, Characteristic of a ring: Definition and examples, Definition and examples of Nilpotent, Idempotent, product of rings, Definition and examples of Ideal, Definition of Sum of two ideals and examples, Definition of Simple Ring.

RECOMMENDED BOOK

1. A Course in Abstract Algebra, Vijay K. Khanna, S.K.Bhambri;Vikas Publishing House Pvt.Ltd., New - Delhi – 110014, Fourth Revised Edition 2013.

SCOPE OF SYLLABUS

Unit 1: Chapter 2

Unit 2: Chapter 3 and Chapter 7

REFERENCE BOOKS:

1. Topics in Algebra,HersteinI.N.;Vikas Publishing House,1979.
2. Fundamentals of Abstract Algebra ,Malik D. S. Morderson J. N. and Sen M. K. McGraw Hill,1997.
3. A TextBook of Modern Abstract Algebra, Shanti Narayan
4. Modern Algebra, Surjeet Sing and Quazi Zameeruddin; Vikas Publishing House, 1991.
5. Lectures on Abstract Algebra, T. M. Karade, J. N. Salunkhe, K. S. Adhav, M.S.Bendre, Sonu Nilu, Einstein Foundation International, Nagpur 440022.
6. Basic AlgebraVol.I & II, N.Jacobson, W.H.Freeman 1980.
7. Algebra,Vivek Sahaiand Vikas Bist Naros Publishing House,1197.
8. A First Course in Abstract Algebra by John B. Fraleigh Pearson Education; Seventh edition (2014)