

**BACHELLOR OF ARTS / SCIENCE**  
**4th SEMESTER**

**DISCIPLINE SPECIFIC COURSES -IV (CORE-IV)**

**MM420C: MATHEMATICS / APPLIED MATHEMATICS: ALGEBRA**

**THEORY (4 CREDITS: 60 HOURS)**

**CREDITS THEORY-4, TUTORIAL: 2**

**MAXIMUM MARKS: 60, MINIMUM MARKS: 24.**

**Objectives:** The aim of this course is to learn the concepts of algebraic structures and their applications in other sciences.

**UNIT-1 (15 HOURS)**

Groups, Semi-groups and sub-groups, Cyclic groups and their sub-groups, cosets and Lagrange's theorem, product of sub-groups, counting principle for the number of elements in HK, normaliser and centre.

**UNIT-2 (15 HOURS)**

Normal subgroups and various criteria for normality of a sub-group, Quotient Groups, Group homomorphism and isomorphism, Examples.

**UNIT-3 (15 HOURS)**

Fundamental theorem of homomorphism, Correspondence theorem, second and third theorems of isomorphism, Permutation Group, Even and odd Permutations, Symmetric group of degree  $n$ , alternating group, simple group, Cayley's theorem.

**UNIT-4 (15 HOURS)**

Rings, Division rings and Fields, Sub-rings and Sub-fields, Ideals, Quotient rings, Principal ideals, Prime ideals, Maximal ideals and characterisations in terms of their associated quotient rings, Ring homomorphism and isomorphism, theorems on ring isomorphisms.

**TUTORIALS (2 CREDITS: 30 HOURS)      Maximum Marks: 30 Minimum Marks: 12**

11. Tutorials based on Unit I & II - **1 credit**

12. Tutorials based on Unit III & IV – **1 credit.**

**Books recommended**

1. John B. Fraleigh, *A First Course in Abstract Algebra*, 7<sup>th</sup> Ed., Pearson 2002.
2. M. Artin, *Abstract Algebra*, 2<sup>nd</sup> Ed., Pearson 2011.
3. Joseph A Gallian, *Contemporary Abstract Algebra*, 4<sup>th</sup> Ed., Narosa 1999.
4. I. N. Herstein, *Topics in Algebra*.
5. S. Singh and Q. Zameer Din, *Modern Algebra*.