Course Name: Advanced Abstract Algebra
Course Code: MAT501

SYLLABUS:

Normal subgroups and Homomorphism

Introduction, Normal subgroups, Quotient groups, Conjugate element, Center of group, Normalizer of an element, Homomorphism and Isomorphism theorems of groups.

Class Equation and Sylow's theorem

Cayley's theorem, Class equations, Direct product of groups (External and Internal), Cauchy's Theorem for finite abelian groups, *p*-Sylow Subgroups, Sylow's Theorem, Applications of *p*-Sylow subgroups.

Composition Series, Jordan Holder Theorem and Solvable group

Normal and subnormal series, composition series, Jordan Holder Theorem, Solvable Groups, Simplicity of An($n \geq 5$), Nilpotent Groups.

Rings, Fields and Galois Extension

Quotient Ring, Ring over Rational Field, Homomorphism and Embedding of Rings, Ideals, Prime and Maximal Ideals, Divisibility in an Integral Domain, Units, Associates, Prime Elements. Unique Factorization Domain, Principal Ideal Domain, Euclidean Domain, Polynomial Rings and Irreducibility Criteria, Eisenstein's Criterion of Irreducibility, Extension Fields, Finite, Algebraic and Transcendental Extensions, Simple and Algebraic Field Extensions, Splitting Fields and Normal Extensions, Algebraically Closed Fields, Galois Groups, Galois Extension, Galois Correspondence.

REFERENCES

1. John B. Fraleigh,(2002), *A First Course in Abstract Algebra* (7^{th} Edition), Pearson, 2002.
2. Joseph A Gallian, (1999), *Contemporary Abstract Algebra* (4^{th} Edition), Narosa, 1999.
3. I. N. Herstein,(1975), *Topics in Algebra*, Wiley Eastern Ltd., New Delhi.
4. V. K. Khanna and S. K. Bhambri (2021), *A Course in Abstract Algebra* (5^{th} Edition), Vikas Publication House.
5. RamjiLal, Algebra 1: *Groups, Rings, Fields and Arithmetic*, Springer, 2017.

SUGGESTED READINGS

1. P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul: *Basic Abstract Algebra*, Cambridge Press, 1994.
2. David S. Dummit and Richard M. Foote: *Abstract Algebra* (3^{rd} Edition), Wiley, 2011.
3. Michael Artin: *Algebra* (2^{nd} edition), Pearson, 2014.