

## Syllabus for the Algebra Preliminary Exam (Based on MATH – 621, Algebra)

**Groups:** Groups, subgroups and cosets, cyclic groups, Lagrange's Theorem, normal subgroups, group homomorphisms, quotient groups, Isomorphism Theorems I, II, and III, symmetric, alternating, dihedral groups. The Sylow Theorems (1st, 2nd, and 3rd), classification of finite abelian groups [1, Ch. I Sec: 1 - 6, Ch. II Sec: 4,5].

**Rings:** Rings and homomorphisms, ideals, factorization in commutative rings, principal ideal domains (PID), unique factorization domain (UFD), quotient rings, polynomial rings, formal power series rings, factorization in polynomial rings [1, Ch. III (except localization in Sec 4)].

**Fields:** Fields, finite fields, field extensions, algebraic field extensions [1, Ch. V Sec 1].

## References

- [1] Thomas W. Hungerford: *Algebra*, Springer Verlag, Graduate Texts in Mathematics (GTM – 73), (2000).