Modern Algebra Preliminary Exam
Exam Syllabus

Department of Mathematics
University of Houston

- Group theory
  - Groups, subgroups, and homomorphisms
  - Quotient groups and the isomorphism theorems
  - Symmetric, alternating, and dihedral groups
  - Group actions, the class equation, and the Sylow theorems
  - Direct and semidirect products and the Fundamental Theorem of Finitely Generated Abelian Groups
- Ring theory
  - Rings, subrings, and ideals
  - Ring homomorphisms, quotient rings, and the isomorphism theorems
  - Euclidean Domains, PIDs, UFDs, and Noetherian Rings
  - Polynomial rings, irreducibility and unique factorization in polynomial rings, polynomial rings over fields
- Field and Galois theory
  - Finite, algebraic, and finitely generated field extensions
  - Finite fields
  - Splitting fields and algebraic closures
  - Normal and separable extensions
  - The Fundamental Theorem of Galois Theory
  - Examples and applications of the Galois correspondence

In addition to the above core topics, the prelim exam may cover adjacent topics at the discretion of the instructor who last taught the course. If you did not take the course last taught, contact the instructor to find out about topics covered.

Reference Texts:

[1] Abstract Algebra, 3rd Edition, by David Dummit and Richard Foote

[2] Algebra (Graduate Texts in Mathematics v.73), 8th Edition, by Thomas Hungerford

[3] Algebra (Graduate Texts in Mathematics v.211), Revised 3th Edition, by Serge Lang

[4] Galois Theory, by Patrick Morandi

Group Theory References: [1, Ch.1–5], [2, Ch.1, Sec.1–7 and Ch.2, Sec.1–6], [3, Ch.1, Sec.1–8]

Ring Theory References: [1, Ch.7–9], [2, Ch.3], [3, Ch.2], [4, Appendix A]

Field and Galois Theory References: [1, Ch.13 and Ch.14, Sec.14.1–14.7], [2, Ch.5, Sec.1–6], [3, Ch.5, Sec. 1–5 and Ch.6, Sec. 1–4], [4, Sec. 1–6, 13–16]