MODERN ALGEBRA PRELIMINARY EXAMINATION SYLLABUS

November 4, 2004

The typical first year graduate course in modern algebra reflects the interests of the instructor. The professor who taught the most recent Modern Algebra sequence at the University of Houston most likely will be the person developing the examination. Graduate students who took his or her course or who studied the material elsewhere should consult with the instructor on specific texts and highlighting topics.

- **SET THEORY:** Well-Ordering, Axiom of Choice, Zorn's Lemma, Hausdorff Maximality Principle, Products, the product and sum of cardinals.
- **GROUPS:** Subgroups, Lagrange's Theorem, Normal subgroups and factor groups, the Isomorphism and Correspondence Theorems, the Sylow theorems, structure of finite abelian groups.
- **COMMUTATIVE RINGS:** Integral domains and fields of fractions, Ideals, Homomorphisms and factor rings, Principal Ideal Domains, Unique Factorization Domains, Polynomial rings.
- **MODULES:** Homomorphisms, Free and projective modules, Tensor products, Finitely generated modules over Principal Ideal Domains, Localizations.
- **FIELDS AND GALOIS THEORY:** Splitting fields, separable polynomials, the Galois Correspondence, Finite fields.
- **UNIVERSAL ALGEBRA:** General homomorphism and isomorphism theorems, Free Algebras in equational classes, Co-products, Ultraproducts, Lattices.

REFERENCES: Thomas W. Hungerford, Serge Lang, P. M. Cohen, P. Samuel and O. Zarisky.