Qualifying Exam Syllabus for ALGEBRA (MAS 6311-2):

Textbook: Dummit and Foote

Exam Syllabus:

Assumed Background Knowledge:

Basic Properties of Groups, Examples, Homomorphisms, Normal Subgroups, Quotients (roughly Dummit and Foote 1.1-3.2) Basic Properties of Rings, Examples, Ideals, Homomorphisms, Quotients (roughly 7.1-7.4) Linear Algebra: definition of a field, vector spaces and linear transformations as in an theoretical linear algebra course (roughly 11.1-11.4)

First Semester (MAS 6331): 3.3-3.5: Isomorphism theorems, composition series, A_n .

4.1-4.6: Group actions, Sylow theorems, simplicity of A_n .

5.1-5.5: Direct and semidirect products of groups.

6.1: p-groups, nilpotent groups, and solvable groups.

7.5-7.6: Fraction rings and Chinese remainder theorem.

8.1-8.3: Euclidean domains, PIDs, and UFDs.

9.1-9.5: Polynomial rings.

Second Semester (MAS 6332): 10.1-10.4: Modules and tensor products. 12.1-12.3: Modules over a PID, rational and Jordan canonical forms.

13.1-13.6: Field theory, including algebraic, separable, and cyclotomic extensions.

14.1-14.6: Galois theory, finite fields, and Galois groups of polynomials.