Algebra (Ph.D.)

Preparatory Courses: Math 5613, 5623

1. Group Theory: Homomorphism theorems; direct products; symmetric groups; normal subgroups; Sylow theorems; abelian groups; free groups; solvable groups; nilpotent groups; generators and relations

2. Ring Theory: Polynomial rings; PIDs; Euclidean domains; FDs; fields of fractions; Noetherian and Artinian rings; radicals; prime and maximal ideals; semisimple rings; primitive rings; Hilbert basis theorem

3. Module Theory: Projectives; injectives; free modules; tensor products; fundamental theorem on finitely generated modules over PIDs; exact sequences

4. Field Theory: Extensions; splitting fields; separability; Galois theory; finite fields; Fundamental Theorem of Algebra

REFERENCES: S. Lang, *Algebra*; T. Hungerford, *Algebra* ; Herstein, *Topics in Algebra*; E. Artin, *Galois Theory*; L. Grove, *Algebra.*