

Department: MATHEMATICAL SCIENCES

Semester Hours: 3

Course Title and Number: MATH 421/521 - Abstract Algebra II

Course Description: Continuation of Math 420/520. Homomorphisms and factor groups; introduction to commutative rings, with emphasis on polynomial rings; and fields, and algebraic extensions. Applications to classical geometric problems.

PRQ: 420/520

Course Objectives: To gain functional understanding of and skills for working with

- Mathematical reasoning in general and algebraic proofs in particular.
- Creation and communication of abstract mathematical ideas.
- Theoretical foundations of algebraic equations and processes.
- Abstract contexts that unify systems of permutations, matrices, numbers, and polynomials.
- Properties and applications of polynomials and number systems.

Syllabus:

- Review of group theory: permutation and matrix groups, subgroups, cyclic groups, isomorphisms; homomorphisms; normal subgroups and factor groups.
- Polynomials: fields; factors and roots; polynomials with integer coefficients; Kronecker's theorem.
- Commutative rings: commutative rings; integral domains; ring homomorphisms; ideals and factor rings; quotient fields.
- Fields: algebraic elements; finite and algebraic extensions; geometric constructions; splitting fields; finite fields.

Current Textbook: J. Beachy and W. Blair, **Abstract Algebra**, 3rd ed., Waveland Press (2006), ISBN 1577664434.

Selective Bibliography:

- G. Birkhoff and S. MacLane, **A Survey of Modern Algebra**, 1st ed., A K Peters/CRC Press (1998).
- J. Fraleigh, **A First Course in Abstract Algebra**, 7th ed., Pearson (2002).
- I. Herstein, **Abstract Algebra**, 3rd ed., Prentice-Hall (1996).