

MATH 210AB : ALGEBRAIC STRUCTURES

California State University, Sacramento · Department of Mathematics & Statistics

General algebraic systems and concepts; groups; rings; fields; vector spaces; Galois theory. Sequence begins every other Fall.

CATALOG DESCRIPTION

(210A) General algebraic systems and concepts; groups. (210B) Fields; vector spaces; Galois theory. **Graded:** Graded Student. **Units:** 3.0.

PREREQUISITES

(210A) Math 110B. (210B) Math 210A is prerequisite to Math 210B.

COURSE OUTLINE

I. Group Theory

- A. Definition and examples
- B. Subgroups and Lagrange's theorem
- C. Normal subgroups, quotient groups and homomorphisms
- D. Automorphisms
- E. Permutation groups and Cayley's theorem
- F. Group actions
- G. Class equation
- H. Sylow's theorem
 - I. Direct products
 - J. Fundamental theorem of finite abelian groups

II. Ring Theory

- A. Definition and examples
- B. Ideals, quotient rings and homomorphisms
- C. Maximal and prime ideals
- D. Field of quotients of an integral domain
- E. Euclidean rings
- F. Principal ideal rings
- G. Polynomial rings

III. Vector Spaces

- A. Definition and examples
- B. Linear independence and bases

- C. Dual spaces ¹
- D. Inner product spaces ¹

IV. Field Theory

- A. Extension Fields
- B. Roots of polynomials and splitting fields
- C. Construction with straightedge and compass
- D. Galois theory
- E. Solvability by radicals

The written exam in Algebra will cover the content of the non-optional sections of this outline.

REFERENCES

- *Topics in Algebra*, by Herstein
- *Basic Algebra I*, by Jacobson, Dummit, & Foote

¹Optional