ABSRACT ALGEBRA II
MATH 4120/8126

1.0 Course Description

1.1 Overview of Content and Purpose: (3 hours) Beginning graduate course in abstract algebra to include rings, integral domains, fields, vector spaces, ideals, algebraic number fields, finite fields, and introduction to Galois Theory.

1.2 For whom Intended: The course is intended for both undergraduate and graduate students.

1.3 Prerequisite: MATH 4110/8116

2.0 Objectives

2.1 Performance Objectives for the Student: The course attempts to develop abstract concepts by the analysis of concrete and often familiar situations. Results of classical algebra are given grater generality and unity by reinterpretation in frameworks of appropriate postulation systems.

3.0 Content and Organization

3.1 Topics:

1. Ideals and factor rings
    a. Ideas
    b. Factor rings
    c. Prime ideals and maximal ideals
2. Ring homomorphisms
    a. Properties of ring homomorphisms
    b. Quotient fields
3. Polynomial rings
    a. Division Algorithm
4. Factorization of polynomials
    a. Reducibility tests
    b. Irreducibility tests
    c. Uniqute factorization in Z(x)
5. Divisibility in integral domains
    a. Irreducbiles, primes
    b. Unique factorization domains
    c. Euclidean domains
6. Vector spaces
    a. Subspaces
    b. Linear independence
7. Extension fields
    a. Fundamental theory of Field Theory
    b. Splitting fields
    c. Zeros of an irreducible polynomial
8. Algebraic extensions
    a. Characterization of extensions
    b. Finite extensions
    c. Properties of algebraic extensions if time permits

9. Finite fields
    a. Classification of finite fields
    b. Structure of finite fields
    c. Subfields of finite fields
10. An introduction to Galois theory
    a. Fundamental Theorem of Galois Theory
    b. Solvability of polynomials of radicals
    c. Insolvability of Quintic

4.0 Teaching Methodology

4.1 Methods to be Used: The course will be presented by lecture with discussion and questions as well as problem assignments.

4.2 Students Role in Course: Students will be required to do problems weekly.

4.3 Contact Hours: Contact Hours=3

5.0 Evaluation

5.1 Basis for Evaluating Student Performance: Students will be evaluated by examinations and assigned problems. Graduate students will be given additional homework assignments.

5.2 Basis for Determining Final grade:
Final=25%
In Class Exams=50%
Problem Assignments=25%

5.3 Grading Scale:
97-100%=A+; 90-96%=A
87-89%=B+; 80-86%=B
77-79%=C+; 70-76%=C
67-69%=D+; 60-66%=D; below 60%=F

6.0 Resource Materials

6.1 Textbook(s) or Other Required Readings: Gallian, J.A., *Contemporary Abstract Algebra*, Heath, 1986.

6.2 Current Bibliography of Resources:

1. Birkhoff, G., and MacLane, S., *A Survey of Modern Algebra*, MacMillian, 1986.
2. Fraleigh, J.B., *A First Course in Abstract Algebra,* Addison-Wesley,

3. Herstein, I.N., *Abstract Algebra*, MacMillan, 1986.

4. McCoy, N.M., *Fundamentals of Abstract Algebra*, Allyn and Bacon, 1972.
5. Pinter, C.C., *A Book of Abstract Algebra*, McGraw-Hill, 1982.