SOUTHERN UNIVERSITY AND A&M COLLEGE
DEPARTMENT OF MATHEMATICS

MATH 435
MODERN ALGEBRA II

Course Name: Modern Algebra II

Course Number: Mathematics 435

Credit Hours: 3 hours

Textbook: John B. Fraleigh, **A First Course in Abstract Algebra**, 4th edition, Addison-Wesley, Reading, MA, 1989

Professor:

Email Address:

Office:

Office Hours:

CATALOG DESCRIPTION:

Modern Algebra II is a continuation of Mathematics 330, an introduction to the basic concepts in modern abstract algebra. In Modern Algebra II, two broad classes of abstract algebra called rings and fields will be studied. Topics include rings, fields, polynomial rings, noncommutative rings, factor rings, ideals, prime ideals, maximal ideals, unique factorization domains, Euclidean domains, Gaussian integers, norms, homomorphisms, and isomorphisms.

PREREQUISITE: Modern Algebra I, Math 330

Learning Outcomes:

Upon successful completion of this course, the student will be able to:

1. Demonstrate the techniques and methods of abstract mathematical proofs.

2. Use the axiomatic method to construct mathematically correct proofs.
3. Demonstrate knowledge of the behavior of elements in a ring or a field.
4. Describe and perform operations with structural elements of rings and fields.
5. Identify the properties which describe rings and fields.
6. Identify and describe the properties of mappings from the ring to another ring and from one field to another field.
7. Recognize and prove properties of subrings.
8. Use subrings to describe the structure of rings.

COURSE CONTENT:

A. Homomorphisms and Factor Groups

3.1 Homomorphisms
3.2 Isomorphism and Cayley's Theorem
3.3 Factor Groups

B. Advanced Group Theory

4.1 Isomorphism Theorems: Proof of the Jordan-Hölder Theorem
4.2 Sylow Theorems
4.3 Application of the Sylow Theory
4.4 Free Abelian Groups
4.5 Free Groups
4.6 Group Presentations

C. Introduction to Rings and Fields

5.1 Rings and Fields
5.2 Integral Domains
5.3 Fermat's and Euler's Theorems
5.4 The Field of Quotients of an Integral Domain
5.5 Rings of Polynomials
5.6 Factorization of Polynomials over a Field
5.7 Noncommutative Examples

D. Factor Rings and Ideals

6.1 Homomorphisms and Factor Rings
6.2 Prime and Maximal Ideals

E. Factorization

7.1 Unique Factorization Domains

7.2 Euclidean Domains
7.3 Gaussian Integers and Norms

INSTRUCTIONAL TECHNIQUES:

1. Lectures and other activities in the classroom.

2. Use of computers in the Mathematics Laboratory (Room 318, T. T. Allain).

3. Conference Hours (Question and Answer, and Problem Solving).

4. Study Sessions (Classroom, Mathematics Laboratory, and Library).

5. Group Sessions at the chalkboard.

6. Use of an Overhead Projector.

COURSE REQUIREMENTS:

A. Academic Requirements

a. Written assignments from exercises in textbook.

b. Written assignments given by the instructor.

c. Quizzes and tests.

d. Bonus assignments given by the instructor.

e. Classroom activities.

f. A Final Examination.

B. Administrative Requirements

a. While attendance is optional, students enrolled in Mathematics 435 are encouraged to attend classes regularly and punctually. Each student should be aware that there is no direct penalty for missing class nor is there any direct reward for being present. However, any work missed is left to the discretion of the instructor as to whether it can be made up. Any student required to be absent from class due to illness or other unavoidable circumstances should promptly report such reasons to the instructor, keeping in mind that excuses explain absences, but do not remove them. All excuses or explanations must be submitted in writing.

b. Incomplete grades are given upon request by the student and approved by the Dean of the College (in which the student resides) and the instructor. If a student presents official paperwork indicating extenuating circumstances do exist and it is highly probable that the student can complete the remaining work in the specified time frame (6 weeks), then the instructor shall give due consideration to the request. If an excuse is not given, the delinquent work shall be considered to be of failing quality and the "I" grade is not to be given.

c. Bonus points (if any) are averaged at the end of the semester. This means the mid-semester grade is based solely on test and quiz scores.

d. Bonus assignments, classroom participation points, and quizzes cannot be made up. Also, bonus assignments are not accepted after the due date.

e. Make-ups are given only on the discretion of the instructor, provided a proper excuse is presented. If permitted, the time and day must be agreed to by the student and the instructor.

f. Visitors, with the exception of children, are permitted in the class only upon permission from the instructor. According to university bylaws, children are prohibited from attending class.

C. Student Assistance

Students requiring assistance with class work may receive assistance from any or all of the following:

a. the instructor,

b. the Mathematics Laboratory - Room 318, T. T. Allain Hall, or

c. the Special Services Program - W. W. Stewart Hall.

ATTENDANCE:

See the Southern University Catalog regarding class attendance. Each student should make note that there is no direct penalty for missing class nor is there any direct reward for being present.

EVALUATION OF STUDENTS:

Students will be evaluated on the basis of scores earned on the following:

a. 50-minute examinations (the number to be determined by the instructor)

b. One Final Examination

c. Quizzes

d. Points awarded for participating in classroom activities

e. Bonus assignments

PROBLEM SETS: Four problem sets must be completed by a specified date. The student should not receive any help to complete them. The problem sets will be collected and graded.

HOMEWORK: Homework will be assigned on a daily basis. These problems will not be collected, so the student may receive help to complete them.

TERM PAPER: A term paper on the biographies of five persons who made contributions to abstract algebra and the concepts that they introduced. The term paper is due on or before two class meetings before the last day of classes for the term.

POINT VALUE:

Term Paper ----------	100 pts
4 Problems Sets ----------	200 pts
3 Hour Exams ----------	300 pts
FINAL Exam ----------	200 pts
TOTAL ----------	**800 pts**

GRADING SCALE:

Average	**Grade**
90 – 100	**A**
80 - 89	**B**
70 - 79	**C**
55 - 69	**D**
BELOW 55	**F**

DISABILITY STATEMENT:

Students that are considered as having a disability are to provide the professor with a letter from the Department of Special Education stating the appropriate accommodations required of this course. If you have a documented disability, then please discuss it with personnel at 771-3950 in Room 125 of Blanks Hall.