

## MAT 425

### MODERN ALGEBRA

8:00 - 9:25 Tuesday/Thursday

Broom 171

SPRING SEMESTER 2015

#### Catalog Description

MAT 425. MODERN ALGEBRA. Structure of general algebraic systems; elementary properties of groups, rings, fields, vector spaces. Prerequisite: MAT 252. (3 hours credit.)

A student must have a minimum grade of C in MAT 251 to be admitted to this class.

#### Text

Jimmie Gilbert, Linda Gilbert. Elements of Modern Algebra. Fifth Edition. 2000. Brooks/Cole Publishing Company.

#### General Course Objectives

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

1. Define the terms group, abelian group, cyclic group, and subgroup.
2. Demonstrate and communicate his understanding of the basic properties of groups by determining if a set with its operation gives a group structure.
3. Demonstrate and communicate his understanding of the concept of a subgroup by determining if a subset of a group is a subgroup.
4. Find the order of groups and subgroups.
5. Demonstrate and communicate his understanding of the concepts of a cyclic group and a cyclic subgroup.
6. Demonstrate and communicate his understanding of permutation groups.
7. State and prove Cayley's Theorem.
8. Define the term coset and generate cosets of specific groups.
9. State and prove Lagrange's Theorem.
10. State the Fundamental Theorem of Finitely Generated Abelian Groups.\*
11. Demonstrate and communicate his understanding of group homomorphisms.
12. Demonstrate and communicate his understanding of factor groups.
13. State the First, Second, and Third Sylow Theorems.\*
14. Demonstrate his understanding of the basic properties of rings, fields, and ideals.
15. Demonstrate and communicate his understanding of ring homomorphisms.
16. Demonstrate and communicate his understanding of ideals, maximal ideals, and prime ideals.
17. Demonstrate and communicate his understanding of fields of quotients and integral domains.
18. Construct proofs of standard algebraic results.

\*If time allows

#### Subject Matter or Content to be Studied

1. Groups
2. Group Homomorphisms
3. Rings, Fields, and Ideals
4. Ring Homomorphisms

## Activities and Requirements

1. Class attendance, as determined by the regulations of the university and the department.
2. Homework exercises to be completed by the student and graded at the discretion of the instructor.
3. Participation in class discussion.
4. Scheduled tests will be given periodically throughout the semester. Students will be given adequate notice.
5. A comprehensive final examination will be given as scheduled at the end of the semester.
6. Regular and punctual attendance is necessary for successful completion of this course.

## Presentation Methods

Lecture as well as cooperative learning (75%); class discussion (25%).

## Evaluation and Grading

4 tests daily grade (to include homework, pop-quizzes)	Four 100-point tests Several 20-point quizzes will be given during the semester. Also, homework will be taken at the discretion of the instructor. The combined grade of quizzes and homework will be computed for the daily grade which will count like a major test.
Final examination grade	A 200-point comprehensive final examination.

Final Examination Date: Tuesday, May 5, 8:00 a.m.

**Because communication of ideas is an essential part of mathematics as well as everyday life, assignments involving writing will be made and graded. These assignments will frequently be in the form of proofs of theorems or other properties integral to the study of abstract algebra. It is important that you learn the process for writing proofs in order to clearly communicate mathematical ideas.**

## Grading Scale

Grades will be assigned according to the following scale:

A (90% - 100%) B (80% - 89%) C (70% - 79%) D (60% - 69%) F (below 60%)

Cheating and plagiarism are not tolerated. If it is established that a violation has occurred, the instructor may determine the penalty, or he may report the offense to the department chair and dean of the school. The usual penalty involves a grade of zero on the test, examination, or paper in question.

## Make up Tests, Class Attendance, and Tardiness

A student absent from class and missing a scheduled test is entitled to a make up test if evidence is presented to the instructor that the absence was due to personal illness or death in the immediate family. Absences authorized by the Vice President for Academic Affairs for official purposes (athletics, performing groups, student government, etc.) also entitle a student to make up test privileges. Any absence from scheduled work must be covered by an excuse from the Vice President for Academic Affairs, Student Health Services, or a doctor before the student is allowed to make up that work. Any exception to this rule must be arranged before the missed work! Each student is directly responsible to the individual faculty member for making up work missed due to excused absences. ALL make up work must be completed with one week after returning to class. In order to receive credit in this course, a student must attend a minimum of 75% of the class meetings. Students in this class will be allowed no more than 7 absences, excused and unexcused. If a student exceeds the allowable number of absences, a grade of "F" will be assigned in the course. In order to be counted present, a student must arrive on time for the class and remain in class the entire time. When a student is tardy for a class, it is the student's responsibility to talk to the faculty member about changing the recorded absence to a tardy.

This must be done on the day that the tardy occurred. Failure to do so will result in a recorded absence.

### Classroom Policies

1. Do not use tobacco or eat in the classroom.
2. Do not bring guests, including children, to class.
3. Come to class **on time**.
4. Be prepared to start class at the scheduled time. Have paper, pencil, book, homework, etc., out and ready.
5. Do not ask to leave class early. Schedule any appointments at times that do not conflict with classroom time.
6. Calculator use is permitted and encouraged on all homework assignments and tests.
7. Be sure to show all work on homework assignments and tests. No partial credit can be given if no work is shown.
8. Homework must be turned in when it is due. No late homework will be accepted.
9. Cheating and plagiarism are not tolerated. If it is established that a violation has occurred, the penalty will be a zero on the test, examination, or paper in question.
10. It is the responsibility of the individual student to inform the faculty member of any clinically diagnosed learning disability or other limiting disability that might in some way hinder the student's progress in this class. Reasonable accommodations are available upon request.
11. Cell phones and pagers must be turned off and stored out of sight while in class. A violation of this will result in the user's loss of the cell phone for an indefinite period of time.
12. Pop quizzes can only be made up if the absence is excused.

### Important Dates

Students who remain in the course after January 27, 2015, and who then elect to drop the course will receive a grade of W if passing or a grade of F if failing the course at the time of the drop. A drop is not effective and complete until the drop slip has been signed by all parties designated and turned in to the Registrar's Office. No course may be dropped after May 1. The final examination for the course is scheduled for Tuesday, May 5, 8:00 a.m. That is when it **must** be taken. If you plan to audit this course, you must notify the instructor by January 26. You will not be allowed to change your status in this class from credit to audit after this date.

Delta State University is committed to a policy of equal employment and educational opportunity. Delta State University does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, or veteran status. This policy extends to all programs and activities supported by the University.

**If a student has a disability that qualifies under the American with Disabilities Act and requires accommodation, he should contact the Counseling Center (Student Health Center; phone 846-4690) for information on appropriate policies and procedures.**

**Instructor:** Dr. Clifton Wingard

**Instructor's Office:** Broom Hall 281

**Office Phone:** 846-4510

**E-mail:** cwingard@deltastate.edu

### Instructor's Office Hours:

Monday	Tuesday	Wednesday	Thursday	Friday
9:00-9:50 1:30-4:30	9:25-11:45 3:00-4:30	9:00-9:50 1:30-4:30	9:25-11:45 3:00-4:30	9:00-9:50

## Admission Policy for Programs Offered through The Mathematics Department

### Provisional Admission

Students entering Delta State University who declare a major offered through the Department of Mathematics are initially admitted with *provisional status*. Students who demonstrate satisfactory performance in a core of introductory mathematics courses (as defined below) are granted *full admission* to the program. The intent of this policy is to insure that all students gain basic knowledge and skills in introductory core courses that are required for the level of scholarship expected from them in their advanced studies and in their future professions.

### Full Admission

Full admission is granted upon satisfactory completion of the following introductory mathematics core:

MAT 104/105 or 106	College Algebra and Trigonometry or Precalculus
MAT 251	Calculus I

*Satisfactory completion* is defined as having completed a course with a grade of C or better. **Any grade below C must be removed by repeating the course and earning a grade of C or better.** Students should be aware that repeating courses may increase the time required for graduation.

When a student fulfills the core requirements, he or she is considered to be adequately prepared to continue with advanced mathematics courses and is granted *full admission* to the program. **A student who has not been granted full admission will not be permitted to register for any upper division mathematics course.** Upper division courses are those MAT courses numbered above 251.

At the close of each semester, each student's record will be reviewed by his or her advisor and the Chair of the Curriculum Committee. The Curriculum Committee will notify each student by letter when he or she achieves full admission status. Students may check their status at any time by contacting their advisors.

Requirements for full admission also apply to students who transfer credit from other institutions. Courses equivalent to the core courses listed above must have been completed with grades of C or better to be accepted for transfer credit. Verification of transcripts should be completed prior to the start of the first semester of enrollment. Upon enrolling for the first semester, a transfer student whose transcript has not been verified will be given provisional status. When it has been verified that the student has fulfilled the requirements, he or she will be granted full admission status. Enrollment in upper division courses will not be permitted until full admission status has been granted.

### Requirements for Graduation

In addition to the graduation requirements stated in the University Bulletin, the Department requires satisfactory academic performance in major courses. Specifically, this means that **the GPA in upper-level courses within the major must be at least 2.5 overall and at least 2.5 on upper-level major courses completed at DSU. No grade below C in a required major course may be applied toward graduation. Any grade below C must be removed by repeating the course and earning a C or better grade. In addition, students will take the Praxis subject area test in mathematics and pass at a published level (see the Department for the most current information). Also, students in the BSE program must have at least a 3.0 grade point average on the completed 44 hours of General Education coursework and at least a 3.0 overall grade point average.**

### Failure to maintain satisfactory academic standing

A student with full admission status who fails to maintain good academic standing will be placed on departmental academic probation. When a student whose GPA in upper level mathematics courses has fallen below 2.0, he or she will be warned that he or she is in danger of being placed on probation, and that the problem course or courses should be retaken. A student who fails to improve the GPA in upper level mathematics to 2.0 or above within two semesters of being warned will be placed on *probationary status*. A student on probation will not be permitted to advance in mathematics course work until such time that the probationary problems have been corrected. Students should be aware that being on probation may increase the time required for graduation.

**MODERN ALGEBRA  
HOMEWORK ASSIGNMENTS**

Chapter 1:        FUNDAMENTALS

- 1.1 Sets
- 1.2 Mappings
- 1.3 Properties of Composite Mappings
- 1.4 Binary Operations
- 1.5 Permutations and Inverses
- 1.6 Matrices
- 1.7 Relations

Tentative Test Dates

- Test 1    January 28
- Test 2    February 25
- Test 3    March 25
- Test 4    April 22

Chapter 2:        THE INTEGERS

- 2.1 Postulates for the Integers
- 2.2 Mathematical Induction
- 2.3 Divisibility
- 2.4 Prime Factors and Greatest Common Divisor
- 2.5 Congruence of Integers
- 2.6 Congruence Classes

Chapter 3:        GROUPS

- 3.1 Definition of a Group
- 3.2 Subgroups
- 3.3 Cyclic Groups
- 3.4 Isomorphisms
- 3.5 Homomorphisms

Chapter 4:        MORE ON GROUPS

- 4.1 Finite Permutations Groups
- 4.2 Cayley's Theorem
- 4.4 Normal Subgroups
- 4.5 Quotient Groups

Chapter 5:        RINGS, INTEGRAL DOMAINS, AND FIELDS

- 5.1 Definition of a Ring
- 5.2 Integral Domains and Fields
- 5.3 The Field of Quotients of an Integral Domain

Final Exam:        Tuesday, May 5, 2015 8:00 a.m.