Abstract Algebra I

Instructor and Class Information

Lecturer:	**Course Num.:**
Office:	**Lecture Room:**
Phone:	**Lecture Times:**
Email:	**Office Hours:**

About Course Goals

FORMAT

The course will meet three times a week for 55 minutes each meeting for lecture. In addition, there will be two recitation classes every week at 55 minutes each. Instruction will be mainly by lecture delivered by the instructor.

DESCRIPTION & GOALS

This course will cover the basics of groups, rings, modules, and linear & multilinear algebra that are necessary for graduate level core mathematics.

PREREQUISITES

Math 5112 or graduate standing.

Textbook

MAIN REFERENCES

Nathan Jacobson: *Basic Algebra I & II* (second edition). Dover.
Serge Lang: *Algebra* (third edition). Springer.

ADDITIONAL REFERENCES

N. Bourbaki: *Algebra, Chapters 1—3.* Springer.

M. Atiyah & I. Macdonald: *Introduction to Commutative Algebra.* Addison Wesley.

Assessments

HOMEWORK ASSIGNMENTS

There will be weekly graded homework assignments.

EXAMS

There will be (at least) one midterm and a final exam.

CLASS PARTICIPATION AND ATTENDANCE

Although attendance is not regularly monitored frequent absences are likely to be noted and may factor into the grade in borderline cases.

Grading

COURSE SCORE
A course score will be computed from the graded homework, the midterm(s), and the final exam.

LETTER GRADES
Letter grades will be determined based on the course score.

Weekly Schedule

Week 1	Definitions (Groups, homomorphisms, normal subgroups) and examples. Presentation of a group. Groups actions. Counting lemmas.
Week 2	Quotient groups. Simple groups. Basic Isomorphism Theorems.
Week 3	Short exact sequences. Semidirect products. Sylow Theorems.
Week 4	Composition series. Jordan-Holder Theorem. Derived groups. Solvable and nilpotent groups.
Week 5	Symmetric groups. Simplicity of alternating groups.
Week 6	Definitions (rings, ideals, modules) and examples. Basic isomorphism results. Finite generation. Integral domains. Characteristic of a ring.
Week 7	Commutative rings. Prime and maximal ideals. Chinese Remainder Theorem.
Week 8	Polynomial rings. Algebraic dependence. Several variables. Modules - direct sums, tensor products, exact sequences.
Week 9	Localization. Noetherian and Artinian rings. Hilbert Basis Theorem.
Week 10	Principal ideal domains. UFD. Modules over a PID.
Week 11	Vector spaces. Basic operations on vector spaces: direct sum, tensor product, dual vector spaces.
Week 12	Bilinear and multilinear forms. Quadratic forms. Positive definite and semidefinite forms.
Week 13	Tensor algebra. Symmetric and exterior algebra. Definition of determinant and minors of an endomorphism.
Week 14	Automorphisms preserving a bilinear form: symplectic and orthogonal matrices. Normal forms of a matrix (including Jordan normal form).

General Policies

ACADEMIC MISCONDUCT
It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct Student Conduct http://studentlife.osu.edu/csc/.

DISABILITY SERVICES

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.