MATH 3350: Introduction to Abstract Algebra

2023 Summer Session	
Total Class Sessions: 25	**Instructor: Staff**
Class Sessions Per Week: 5	**Classroom: TBA**
Total Weeks: 5	**Office Hours: TBA**
Class Session Length (Minutes): 145	**Language: English**
Credit Hours: 4	

Course Description:

This abstract algebra course examines the fundamental properties of basic algebraic structures, especially rings and groups, through concrete examples. Topics discussed mainly cover: sets, groups, permutation groups, cyclic groups, Lagrange's Theorem, subgroups, normal subgroups, quotient groups, direct product of groups, homomorphism and isomorphism of groups, group actions, the Sylow theorems, ring theory, ideals and quotient rings, Euclidean domains, principle ideal domains, unique factorization domains, and polynomial rings. This course will also covers a basic introduction to topics in fields including extension fields, splitting fields if time permits.

Prerequisite： MATH 2160 Linear Algebra

Student Learning Outcomes:

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

1. Demonstrate knowledge and understanding of groups, subgroups, and order of an element in finite groups.
2. Demonstrate knowledge and understanding of the concept of Cosets of a subgroup of a group and normal subgroups.
3. Demonstrate knowledge and understanding of symmetric groups, cyclic groups and their properties.
4. Demonstrate knowledge and understanding of direct product of groups.
5. Demonstrate knowledge and understanding of the concept of quotient groups.
6. Demonstrate knowledge and understanding of the concept of group homomorphism and isomorphism.
7. Demonstrate knowledge and understanding of ring theory, ideals and quotient rings, and polynomial rings.
8. Demonstrate knowledge and understanding to extension fields and splitting fields.

Course Materials:

Textbook:

Abstract Algebra, 3rd Edition, by David S. Dummit (Author), Richard M. Foote (Author); Publication: Wiley; 3 (July 14, 2003)

Language: English
ISBN-10: 0471433349
ISBN-13: 978-0471433347

Other Useful Texts:

Abstract Algebra: Theory & Applications, by Thomas Judson, 2018

Algebra: Abstract and Concrete, by Frederick M. Goodman, 2011

Course Assignments:

Homework Homework will be related to class lecture and in-class discussion. Students shall hand in their finished homework at the beginning of next class. Homework is assigned to help review and enhance understanding on class content.
Quizzes There will be 5 quizzes during this semester. Each quiz will be on the material covered that week. There will be NO make-ups for quizzes for any reason. All of the quizzes will be closed book.
Midterm Exams Two in-class, close-book and non-cumulative midterm exams will be given through this course. The midterm exams will be based on the knowledge covered in class. No excuse will be accepted if students do not have legitimate excuses for absence. Physician Statement is required for missing the exam due.
Final Exam The final will be in-class, cumulative and close-book. The final exams will be based on concepts covered in class. Note that the final will not be taken during the normal class times. Exact time and location for final will be announced later.
Attendance Students are expected to attend and participate in class. Strong attendance and participation are good indicators of success. Each student is responsible for all course material, announcements, quizzes and exams made in class, whether or not the student attended that day's class.

Course Assessment:

Homework	10%
Quizzes	15%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	35%
Total	**100%**

Grading Scale (percentage):

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
98-100	93-97	90-92	88-89	83-87	80-82	78-79	73-77	70-72	68-69	63-67	60-62	<60

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Chengdu University of Technology's *Academic Conduct Code.* Any work suspected of violating the standards of the *Academic Conduct Code* will be reported to the Dean's Office. Penalties for violating the *Academic Conduct Code* may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the *Academic Conduct Code*.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.

Course Schedule:

Week	Topics	Activities
1.	Go through syllabus + Course overview Basic set theory and notations. Set. Subset. Inclusion. Cardinality. Cartesian product. Function. Domain/codomain. Injection/surjection. Inverse. Equivalence relation. Modular arithmetic. First examples of groups. Cyclic groups. Dihedral groups. Symmetric groups. Quaternion group. Matrix groups. Homomorphism. Isomorphism.	Homework Quiz 1
2.	Subgroups. Group actions. Lagrange's Theorem. Centralizers. Normalizers. Stabilizers. Kernels. Normal subgroups. Cyclic subgroups. Generating sets. Quotient groups. Cosets. Isomorphism theorems. Simple groups. Alternating group.	Homework Quiz 2 Review Midterm 1

3.	Group actions. Permutation representation. Cayley's theorem. The class equation. Automorphism groups. Sylow's theorem. Direct products. Structure of finitely generated abelian groups. Semidirect products. Classifying groups of small order. P-groups. Nilpotent groups.	Homework Quiz 3
4.	First examples of rings. Fields. Ring of integers. Hamilton quaternions. Rings of functions. Integral domains. Subrings. Ideals. Polynomial rings. Matrix rings. Group rings. Quadratic number rings. Homomorphism. Subrings. Ideals. Quotient rings. Isomorphism theorems. Ring of fractions. Chinese remainder theorem.	Homework Quiz 4 Review Midterm 2
5.	Euclidean domains. Principal ideal domains. Unique factorization domains. Polynomial rings. Gauss' lemma. Roots. Irreducibility. Eisenstein's criterion. Basic introduction to fields. Extension fields, splitting fields, Geometric Constructions. Review for Final	Homework Quiz 5 Review Final Exam