MATH 3350: Introduction to Abstract Algebra

2021 Winter Session	
Total Class Sessions: 25	**Instructor: Staff**
Class Sessions Per Week: 6	**Classroom: TBA**
Total Weeks: 4	**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.

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.

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 Format and Requirements:

This course has 25 class sessions in total. Each class session is 145 minutes in length. Pre-reading the relevant chapter and attempting the assigned homework problems prior to each class is strongly recommended. Familiarizing with the course material before class, you will gain a better understanding of the information presented during the class. Students are strongly encouraged to ask questions on things they do not understand. Main learning points will be highlighted from the relevant textbook chapters.

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 Assignments and Assessment:

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.

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.	• Homework • Quiz 1 • Quiz 2

	Homomorphism. Isomorphism.	
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. Group actions. Permutation representation. Cayley's theorem. The class equation. Automorphism groups. Sylow's theorem.	● Homework ● Review ● Midterm 1 ● Quiz 3
3.	Direct products. Structure of finitely generated abelian groups. Semidirect products. Classifying groups of small order. P-groups. Nilpotent groups. 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.	● Homework ● Quiz 4 ● Review ● Midterm 2
4.	Subrings. Ideals. Quotient rings. Isomorphism theorems. Ring of fractions. Chinese remainder theorem. Euclidean domains. Principal ideal domains. Unique factorization domains. Polynomial rings. Gauss' lemma. Roots. Irreducibility. Eisenstein's criterion.	● Homework ● Quiz 5 ● Review ● Final Exam