

NEW YORK CITY COLLEGE OF TECHNOLOGY
The City University of New York

DEPARTMENT:	Mathematics
COURSE:	MAT 3080
TITLE:	Modern Algebra
DESCRIPTION:	An introductory course in modern algebra covering groups, rings and fields. Includes connections between algebra and secondary school algebra and geometry.
TEXT:	<u>Abstract Algebra: Theory and Applications</u> Virginia Commonwealth University, Richmond, VA 23284 2021 edition (Free download at http://abstract.ups.edu/download.html) (Hardback copies available at http://abstract.ups.edu/purchase.html)
CREDITS:	4 (4 class hours)
PREREQUISITES:	MAT 2571
	Prepared by Professor Andrew Douglas (Spring 2015) Modified by Professor Nadia Benakli (Spring 2022)

A. Testing/Assessment Guidelines:
The following should be scheduled:

1. Two examinations during the semester
2. Final examination
3. Student presentations
4. Final project

Course Intended Learning Outcomes/Assessment Methods

Learning Outcomes	Assessment Methods
1. Define the terms group, ring and field and be able to give examples of each of these kinds of algebraic structures	Classroom activities and discussion, homework, projects, exams
2. Define the concept of a subgroup and determine (prove or disprove), in specific examples, whether a given subset of a group is a subgroup of the group	Classroom activities and discussion, homework, projects, exams
3. Solve problems and prove simple propositions involving concepts, terms and theorems of group theory	Classroom activities and discussion, homework, projects, exams
4. Compare rings, fields and integral domains	Classroom activities and discussion, homework, projects, exams
5. Solve problems and prove simple propositions involving concepts, terms and theorems of ring theory	Classroom activities and discussion, homework, projects, exams
6. Apply the reducibility and the irreducibility tests for polynomials.	Classroom activities and discussion, homework, projects, exams
7. Describe applications and relationships of group theory to geometry	Classroom activities and discussion, homework, projects, exams
8. Demonstrate knowledge of and ability to apply the mathematical processes of problem solving	Classroom activities and discussion, homework, projects, exams
9. Reason and communicate mathematically	Classroom activities and discussion, homework, projects, exams
10. Organize mathematical reasoning and use the language of mathematics to express mathematical reasoning precisely, both orally and in writing, to multiple audiences.	Classroom activities and discussion, homework, projects, exams

General Education Learning Outcomes/Assessment Methods

Learning Outcomes	Assessment Methods
Information literacy: ● Understand and address the scope and objectives of a manageable research topic ● Identify credible and relevant sources ● Use information effectively to accomplish specific	Research projects, writing assignments, class discussion

<p>purpose, and present information in a clear and meaningful way</p> <ul style="list-style-type: none"> ● Cite sources in an appropriate style ● Incorporate ideas of others in an ethical manner; summarizing, paraphrasing and quoting are correct and appropriate 	
<p>Oral Communication:</p> <ul style="list-style-type: none"> ● Organize ideas and supporting material in a clear and coherent manner ● Use appropriate mathematical language ● Use explanations, examples, illustrations, to support the principal ideas ● Communicate the central message clearly and effectively 	Presentations, class discussion
<p>Written Communication:</p> <ul style="list-style-type: none"> ● Use appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work ● Demonstrate understanding of context, audience, and purpose that is responsive to the assigned task ● Use appropriate sources to develop ideas ● Use language, notation, and style that is appropriate for the discipline and for an assigned task 	Research projects, writing assignments, class discussion, homework
<p>Creative Thinking:</p> <ul style="list-style-type: none"> ● Take risks ● Solve problems ● Connect material within the course and to other courses; synthesize material 	Homework, exams, projects, presentations
<p>Foundations and Skills for Lifelong Learning:</p> <ul style="list-style-type: none"> ● Foster curiosity and independence ● Take initiative 	Projects and presentations

New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

MAT 3080 Modern Algebra

Text: *Abstract Algebra: Theory and Applications* 2021 edition

Week	Topics	Sections
1	Integer Equivalence Classes and Symmetries Groups: Definitions and Examples	3.1 3.2
2	Subgroups Cyclic Subgroups	3.3 4.1
3	Multiplicative Group of Complex Numbers The Method of Repeated Squares	4.2 4.3
4	Permutation Groups – Definitions and Notation Dihedral Groups	5.1 5.2
5	Isomorphisms – Definition and Examples	9.1
6	Direct Products Factor Groups and Normal Subgroups	9.2 10.1
7	Group Homomorphisms The Isomorphism Theorems	11.1 11.2
8	Matrix Groups Symmetry	12.1 12.2
9	Rings Integral Domains and Fields	16.1 16.2
10	Ring Homomorphisms and Ideals	16.3
11	Polynomial Rings The Division Algorithm	17.1 17.2
12	Irreducible Polynomials	17.3
13	Student Presentations	
14	Review	
15	Final Exam	