CENTRAL CONNECTICUT STATE UNIVERSITY
DEPARTMENT OF MATHEMATICAL SCIENCES
MATH 515 SECTION 70
FALL 2020

READ THIS SYLLABUS CAREFULLY. YOU ARE RESPONSIBLE FOR KNOWING THIS INFORMATION!

I. Basic course information

- **Title:** Abstract Algebra I

- **Course Description:** Group Theory: normal subgroups, quotient groups, cyclic groups, permutation groups, classical isomorphism theorems, Sylow theorems, finitely generated abelian groups, groups of small order, group actions. Introduction to Ring Theory: integral domains, fields, ring homomorphisms, and ideals.

- **Prerequisite:** MATH 366 (Instruction to Abstract Algebra), with a grade of C− or higher, or permission of instructor.

- **Instructor:** Prof. Frédéric Latour

- **Office Phone:** 860-832-2855

- **E-mail:** latourfre@ccsu.edu

- **Office:** Marcus White 119

- **Office Hours (virtual):**
  - Mondays: 06:30pm–07:15pm
  - Wednesdays: 05:00pm–07:15pm
  - Thursdays: 06:00pm–08:00pm
  - Other times by appointment.

- **Textbook:** Abstract Algebra (3rd edition), by David S. Dummit and Richard M. Foote

- **Class Meeting Times:** Mondays and Wednesdays, 07:20pm–09:00pm, online.

- **Course Requirements:** Attend and participate in class regularly; complete homework assignments; take quizzes and tests, as scheduled. A general rule for any college course is that you are expected to put in at least 2 hours of work outside of class for every hour in class.

- **Calculator Use:** Calculators will not be needed for this course.
II. Course Objectives

After taking this course, the student should be able to:

(1) Write precise definitions for terms that are used in group theory.
(2) State, prove and use theorems of group theory.
(3) Write precise proofs involving group theory, including group, subgroup, cyclic group, dihedral group, permutation group, matrix group, isomorphism, homomorphism, Lagranges theorem, factor group, the isomorphism theorems, group actions, the Sylow Theorems, direct products, semidirect products, etc.

III. Evaluation

Minimum averages have been established for each of these grades:

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<td>D−</td>
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The average for the course will be based on the following weights:

- Attendance & Participation: 10%
- Homework: 20%
- Exam 1: 15%
- Exam 2: 15%
- Exam 3: 15%
- Final Examination: 25%

Total: 100%

IV. Schedule of Important Dates

- Exam # 1: Wednesday, September 30, in class;
- Exam # 2: Wednesday, October 28, in class;
- Exam # 3: Monday, November 23, in class;
- Final Examination: Monday, December 14, 07:45pm–09:45pm.

Please note: The final examination for this course is cumulative. It covers the entire course.

Homework will normally be due on Fridays at 11:59pm. All homework assignments must be submitted electronically (by e-mail); the preferred format is a single PDF file containing your entire homework assignment. You should learn how to use \LaTeX, as it makes typing mathematical solutions much easier, and produces PDF files as output. You are allowed to collaborate with other students on homework, but the solutions that you submit must be your own. Simply copying another student’s work (or allowing another student to copy your work) is considered cheating and is not acceptable. Late homework will be penalized (see VI. Course Policies).

Attendance and Participation score. The following will have a positive effect on your participation score:

- Giving a correct answer to a non-trivial question asked by the instructor in class;
- Asking a relevant question in class;
- Making good suggestions about the course;

Whether a question or contribution is deemed “relevant”, an answer “correct”, a question “non-trivial” or a suggestion “good” is at the instructor’s discretion.

The following will have a negative effect on your participation score:

- Missing class;
- Arriving late to class.
V. UNIVERSITY POLICIES

Course Accommodations Policy. Please contact me privately to discuss your specific needs if you believe you need course accommodations based on the impact of a disability, medical condition, or if you have emergency medical information to share. I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations. Contact Stephanie Scapeccia in Student Disability Services at: 860-832-1952, Willard-DiLoreto Hall, Room W201, if you are not already registered with them. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your professors.

Inclement Weather Policy. At the discretion of the President of the University, classes may be cancelled or delayed because of inclement weather conditions or special circumstances. The most accurate cancellation and delay information for Central Connecticut State University will be made available on the Storm Phone: 860-832-3333 and on the Web at www.ccsu.edu.

Course Withdrawal Policy. The last day to withdraw from a course is Tuesday, November 17. Approvals for withdrawal are not required; however, it is strongly recommended that students consult with their instructor and academic advisor prior to deciding to withdraw. Cessation of attendance, notice to the instructor, or telephone calls to the Enrollment Center are not considered official notice of a student’s intention to drop the course.

Beginning on Wednesday, November 18, withdrawals are allowed only under extenuating circumstances and require approval of the course instructor and of the Chair of the Department of Mathematical Sciences.

Basic Needs and CCSU Community Pantry. Any student, faculty or staff who faces challenges securing food, baby items, toiletries, or school supplies and believes this may affect his or her performance in the course can visit our on-campus pantry. Maria’s Place CCSU Community Pantry is available for this purpose. For more information, call the pantry’s office at (860) 832-3662, email the coordinator at mariaspantry@ccsu.edu, or visit our online website at http://compassion.ccsu.edu/foodpantry/.

Statement on Discrimination and Harassment. Central Connecticut State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon age; ancestry, color; gender identity and expression; intellectual disability; learning disability; mental disorder; physical disability; marital status, national origin; race; religious creed; sex, (including pregnancy, transgender status, sexual harassment and sexual assault); sexual orientation; or any other status protected by federal or state laws. Any student who has concerns about this should contact the Office of Equity and Inclusion at 860-832-1653, Student Affairs at 860-832-1601, or his/her faculty member. The Office of Equity and Inclusion is located on the main floor of Davidson Hall, room 119.

Statement on Sexual Misconduct, Intimate Partner Violence, and Stalking. Central Connecticut State University (CCSU) will not tolerate sexual misconduct against students, staff, faculty, or visitors in any form, including but not limited to: sexual assault, sexual exploitation, sexual harassment or stalking, as defined in CCSU policies. For additional information, please consult the CCSU policies at http://www.ccsu.edu/diversity/policies/index.html. All faculty members and staff have a duty to report incidents of sexual harassment, including sexual violence, to the Title IX Officer, Office of Equity and Inclusion, Davidson Hall, room 119.

To file a report, contact: Office of Equity and Inclusion (860-832-1653); Student Affairs (860-832-1601); Student Conduct (860-832-1667) or the University Police (860-832-2375).

For support and advocacy, contact: Office of Victim Advocacy & Violence Prevention (Willard-DiLoreto Hall room D305) at 860-832-3795 to speak with Joanna Flanagan (jflanagan@ccsu.edu); Student Wellness Services at 860-832-1945 (confidential), the Women’s Center at 860-832-1655, the local YWCA’s Sexual Assault Crisis Services Hotline at 860-223-1787 (confidential) and Prudence Crandall Center for Domestic Violence (confidential) at 888-774-2900 (24-hour hotline).
Statement on Academic Integrity. All students are expected to demonstrate integrity in the completion of their coursework. Academic integrity means doing one's own work and giving proper credit to the work and ideas of others. It is the responsibility of each student to become familiar with what constitutes academic dishonesty and plagiarism and to avoid all forms of cheating and plagiarism. Students who engage in plagiarism and other forms of academic misconduct will face academic and possibly disciplinary consequences. Academic sanctions can range from a reduced grade for the assignment to a failing grade for the course. From a disciplinary standpoint, an Academic Misconduct Report may be filed and a Faculty Hearing Board may impose sanctions such as probation, suspension or expulsion.

For further information on academic misconduct and its consequences, please consult the Academic Misconduct Policy (http://www.ccsu.edu/AcademicIntegrity) and the Student Code of Conduct (http://web.ccsu.edu/StudentConduct). This policy is rigorously enforced by the Department of Mathematical Sciences.

VI. Course Policies

Resources Available.

(1) If you need help, take advantage of your instructor’s office hours. Do not wait until just before the first test to do so.

(2) The Learning Center is located in Room D316, Willard-DiLoreto Hall. Free tutoring is available. A schedule for hours the Center is open will be posted soon after the beginning of the semester.

(3) Form a study group with other students in your section. Explaining solutions to homework problems to each other is a good way to learn.

(4) A list of private tutors for hire is available in the math department office, Room 128, Marcus White, 860-832-2835.

Late Homework Policy. If you submit written homework after the due date, it will be graded with a penalty equal to a percentage of the points earned, depending on how late the homework is submitted:

- Fewer than seven days late: 15% penalty.
- At least seven days but fewer than fourteen days late: 30% penalty.
- At least fourteen days late, but is handed in on or before the last day of the semester: 50% penalty.
- Handed in after the end of the semester’s final exams: no credit.

Absence Policy. It is your responsibility to learn the material that you missed if you are absent from class. Classes will be recorded and posted online, but you will not receive credit for attendance and participation if you miss class and watch it later.

Academic Dishonesty Policy (cheating). The standard penalty for academic dishonesty is a grade of 0% on the homework, quiz or examination. The following are examples of academic dishonesty:

- Copying another student’s, or a tutor’s homework solutions, or copying solutions from the internet;
- Using, in any way, an instructor’s solutions manual (an instructor’s solutions manual is for use by your instructor only, and not by students or tutors);
- Having an unauthorized formula sheet accessible or visible to you during an examination (whether or not you plan on using it);
- Writing formulas on your hand.

If you are thinking of doing anything that you think is ethically ambiguous, you should ask your instructor if it is cheating. There is no penalty for asking!

The following are NOT cheating:

- Getting help from another student on homework, or working with another student on homework problems, provided that all students write their solutions individually;
- Getting homework help from tutors (Learning Center or private tutors), your professor, or another instructor, provided that you write your solution by yourself.
VII. Course Material

I am planning on covering the material contained in the following sections of the textbook:

Preliminaries
0.1 Basics
0.2 Properties of the Integers
0.3 $\mathbb{Z}/n\mathbb{Z}$: The Integers Modulo $n$

Chapter 1: Introduction to Groups
1.1 Basic Axioms and Examples
1.2 Dihedral Groups
1.3 Symmetric Groups
1.4 Matrix Groups
1.5 The Quaternion Group
1.6 Homomorphisms and Isomorphisms
1.7 Group Actions

Chapter 2: Subgroups
2.1 Definition and Examples
2.2 Centralizers and Normalizers, Stabilizers and Kernels
2.3 Cyclic Groups and Cyclic Subgroups
2.4 Subgroups Generated by Subsets of a Groups
2.5 The Lattice of Subgroups of a Group

Chapter 3: Quotient Groups and Homomorphisms
3.1 Definitions and Examples
3.2 More on Cosets and Lagrange's Theorem
3.3 The Isomorphism Theorems
3.4 Composition Series and the Hölder Program
3.5 Transpositions and the Alternating Group

Chapter 4: Group Actions
4.1 Group Actions and Permutation Representations
4.2 Group Actions on Themselves by Left Multiplication—Cayley's Theorem
4.3 Groups Acting on Themselves by Conjugation—The Class Equation
4.4 Automorphisms
4.5 The Sylow Theorems
4.6 The Simplicity of $A_n$

Chapter 5: Direct and Semidirect Products and Abelian Groups
5.1 Direct Products
5.2 The Fundamental Theorem of Finitely Generated Abelian Groups
5.3 Table of Groups of Small Order
5.4 Recognizing Direct Products
5.5 Semidirect Products

Chapter 6: Further Topics in Group Theory
6.1 $p$-groups, Nilpotent Groups, and Solvable Groups
6.2 Applications in Groups of Medium Order
6.3 A Word on Free Groups
# VIII. Academic Calendar

## AUGUST 2020

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