BOB JONES UNIVERSITY
Department of Mathematics

Ma 411 ~ Abstract Algebra

Instructor:	Dr. Laurel Carpenter	
Office:	AL 46	
Office Hours:	MWF 9:00a.m. or by appointment	https://calendly.com/llcarpen
Preferred Contact:	Teams or email	llcarpen@bju.edu
Class Meetings:	MWF 12:00-1:15p.m. (AL 302)	

Textbooks and Technology

- *Contemporary Abstract Algebra* (10e) by Joseph Gallian, CRC Press: Taylor & Francis Group, 2021. ISBN 978-0-367-65178-7
- Calculators: TI-NSpire CAS or other graphing calculator may be used.

Course Description

The theory of mathematical structures with an emphasis on group theory. Examples are taken from the real number system, linear algebra and calculus. Elements of number and set theory are used extensively. The study of homomorphisms, isomorphisms and related theory is included. (3 credits)

Course Context, Goals, and Rationale

This course is an abstract mathematics course required of upper-level mathematics and mathematics education majors. It is also appropriate for other mathematics related majors who desire a strong grounding in pure mathematical theory. It gives great insight into the structure of the mathematics we use every day. One of the major goals of the course is to further develop the students ability in proof construction.

Prerequisites for this course include Calculus II, Linear Algebra, and Mathematical Proofs.

- **Course Goals:** The student will learn to . . .
  - recognize patterns in mathematical structures.
  - develop models for a variety of mathematical structures.
  - illustrate definitions with examples.
  - develop mathematical theory using definitions.
  - recognize valid proofs.
  - create valid proofs.
  - develop combinatorial mathematics skills.
  - understand the foundations of group theory
  - appreciate the beauty of pure mathematical structure.
  - formulate questions which lead to a deeper understanding of the subject.

These course goals support all objectives of the Division of Mathematical Sciences (as listed in the BJU Course Catalog) as well as the following learning outcomes of the mathematics and mathematics education programs:

- **Mathematics Program Learning Outcomes:** The student will . . .
  - Progress logically from premises to valid conclusions in a variety of mathematical contexts.
  - Select and use technology for understanding as well as a labor-saving . . . tool.
- **Mathematics Education Program Learning Outcomes:** The student will . . .
  - Solve problems in theoretical . . . settings in a variety of mathematical contexts.
  - Progress logically from premises to valid conclusions in a variety of mathematical contexts.

Course Objectives

The student will be able to ...

- define from memory the terms and concepts that have been introduced in the course.
- construct examples illustrating terms and concepts that have been discussed. (NCTM 1.5.1)
- prove from memory theorems that have either been proved in class or assigned as proofs to know.
- work computational problems relating to examples modeling the theory. (NCTM 1.5.2, 1.5.11)
- prove independently theorems from the assigned exercises, thereby indicating ...
  - an understanding of the relevant concepts, and
  - an ability to reason and to express that reasoning process in a manner that cannot be misinterpreted. (NCTM 1.5.1, 1.5.8, 1.5.9, 1.5.14)

Course Requirements and Evaluation

- **Expectations:** Students are ...
  - expected be not only physically present, but also fully awake and engaged during every class meeting.
  - expected to come to class prepared to discuss the topic of the day.
  - encouraged to participate collegially in class discussion.
  - required to peer-evaluate work done by classmates. (on occasion)
  - required to orally present how to solve a problem or prove a theorem. (on occasion)
- **Activities and Assessments:** Table 1 shows the activities and assessments for this course as well as the point values for the various assessments.

Table 1: Course Grading Scheme

	Point Value	**Note**
Problems and Proofs		
Regular Problems (RP)	120	10 points per chapter
Special Problems (SP)	150	75 points per set
Theory Project	100	100 points per project
Peer Review	20	5 points per assignment
Quizzes and Tests		
Quizzes	90	10 points per quiz
Tests	300	100 points per test
Total Point Value	780	

- **Grading Scheme:** The student's course grade will be calculated as total points accumulated divided by the total of the point values listed in Table 1. Some assignments have more available points than the listed point values.
- **Grading Scale:** Standard 10-point scale. Letters grades are subdivided as usual.
- **Problem and Proof Submissions:** Half of the final grade is determined by problems and proofs grades.
  - All work turned in for these assignments with the exception of Peer Reviewed assignments is expected to be the student's own work. (See the Academic Integrity Policy below.)
  - Problems are to be handwritten (unless otherwise specified) on 8.5 by 11 inch paper.
  - Each problem should start on a fresh page with the problem number clearly labeled. Exceptions can be made when consecutive solutions each takes up less than half a page.
  - Use of proper notation, complete sentences, and correct logic is expected.

- **Regular Problem Sets** are typically due two to three calendar days after the end of a chapter. (See the course schedule for due dates marked **RPS**.) Typically, RPS will be collected via Canvas quiz accompanied by a physical copy in the instructor's credenza.
  - Problem sets should be stapled with the problems in correct order. Each problem is to be on a separate page with the students name, problem number, and page number at the top right corner of the page. Page numbering should appear as 1/3 to indicate the first of three pages for that problem.
  - For each chapter, the regular problem set is worth 10 points. Points may be lost on otherwise successful problem sets for lack of neatness and organization or failure to turn in a physical copy.
- **Special Problem Sets** are due at the beginning of Week 8 and the end of Week 15. They may be handed directly to the instructor in class or placed in the instructor's credenza by the end of the day.
  - Special problem sets are to be submitted in a pocket folder with the students name and course clearly labeled on the front. Each problem is to be on a separate page with the students name, problem number, and page number at the top right corner of the page. Page numbering should appear as 1/3 to indicate the first of three pages for that problem. Sets are not to be stapled.
  - For each problem set, the first 15 problems accomplished successfully will be worth 5 points each. The next 10 successful problems will be worth 3 points each. Any successful problems in excess of 15 will be worth 1 point each. (e.g., 30 successful problems may earn a score of 110 out of 75.) Points may be lost on otherwise successful problems for lack of neatness and organization.
- The **Theory Project** is due at the beginning of Week 15. It may be handed directly to the instructor in class or placed in the instructor's credenza by the end of the day.
  - The Theory Project is to be submitted in a pocket folder with the students name and course clearly labeled on the front. Each problem is to be on a separate page with the students name, problem number, and page number at the top right corner of the page. Page numbering should appear as 1/3 to indicate the first of three pages for that problem. Sets are not to be stapled.
  - Each successful problem is worth 5 points. Points may be lost on otherwise successful problems for lack of neatness and organization.

General Policies

- **Deportment:** All meetings are to be conducted in a professional manner. That means, while in attendance students are expected to focus on course related material and to contribute positively to the meeting. The instructor reserve the right to ask a student to leave a meeting should their attention be elsewhere (sleeping, surfing the internet, working on assignments for another class, etc.).

  Professionalism includes the attitudes being conveyed. Respect is to be shown towards all in attendance. Discourse should be gracious. Critique and inquiry is to be collegial – given and received with humility, fairness, and an open-mind.

- **Attendance:** Missed meetings will be counted as course absences. Arriving late or leaving early from a meeting will count as a partial absence. The University's attendance policy is in effect.

- **Missing Work:**
  - **Quizzes and Tests:** Quizzes and Tests are to be taken as scheduled. With the instructor's permission and only in rare cases, a quiz or test may be taken late in such cases the quiz or test will be penalized 10 percentage points per day if taken within three calendar days following the day given in class and will receive a 0 thereafter.
  - **Problem and Proofs:** Problem sets will receive a 0 if not turned in by the due date.
  - **Exceptions:** Exceptions may be granted by the instructor in emergencies. The student is responsible to contact the instructor by Teams as soon as possible to notify them of the emergency.

- **Academic Integrity:** The University's academic integrity policy is in effect (see https://home.bju.edu/bju-policies/ for more details).
  - **Artificial Intelligence:** Because the goal of the assignments in this course is to develop skills rather than simply to complete tasks, and because the use of AI to complete or jump-start tasks defeats that goal, students may not use generative AI tools (i.e. Chat GPT, Bing Chat, Google Bard, etc.) in this course for any assignment without the instructor's explicit permission. Should an AI tool be used with permission, its use must be documented (including the tool used, a summary of the prompts provided and the portions of the assignment that were based on AI generated work).

- **Cheating and Plagiarism:** Cheating is defined as any use of unauthorized helps. Plagiarism is defined as taking someone else's words and/or ideas and claiming them as ones own. All work done for this course must be independent and original. If information is taken from other sources (which is at times appropriate), it must be adequately cited so credit is given to whom it is due. Use standard referencing techniques as taught in En 102.
- **Originality:** Students are permitted (and encouraged) to discuss the ideas of their research but are not permitted to collaborate with anyone other than their instructor graded assignments unless working on a collaborative effort under the explicit direction of the instructor. In which case, the instructor will determine which assignments may be worked on and submitted jointly. Graded assignments should represent the student's own ideas and their own work and should be the product of their own thinking and efforts. A student may not use AI to generate any portion of their papers or presentations without explicit permission from their instructor (and if permission is granted it must be documented as described above).
- **Ask Your Instructor:** If you have a question about any source you are considering using, please gain your instructor's approval before using it. You are always permitted to ask your instructor for help. Any help they choose to provide is acceptable.