MA411-01 Introduction to Abstract Algebra (3 Credits)

Fall (Fanuchånan) 2024

Instructor: Dr. Hyunju Oh

Class Meeting: MW 2:00-3:20pm, Room: SC121

Office: ALS Rm316

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Office Hours: (MTWTh) 12:30 – 1:30pm, (MW) 3:30-4:30pm, or by appointment

Course Code Moodle: MA-411-01

Encryption Key: ma411fa24OH01

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Textbook:
A First Course in Abstract Algebra by John B. Fraleigh, 7 edition.

Catalog Course Description:
This course offers a study of modern algebra with topics from group theory, and ring theory.

Prerequisite:
Grades C or better in both MA 205 and MA 302

Skills and Background Required or Expected:
MA302 (Foundations of Higher Mathematics) is a prerequisite for this course. Students should have some mathematical maturity and exposure to the concept of "PROOF".

Learning Objectives for Students:
- Determine and verify whether a given abstract structure is a group or a ring.
- Recognize and apply the ways of obtaining new structures from given ones like taking subalgebras, quotients, or forming direct products.
- Solve problems dealing with concrete groups like cyclic groups and permutation groups by applying the intrinsic properties of these groups.
- Compare algebraic features of mathematical systems using homomorphism or isomorphism.

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- Prove general statements about properties of groups and rings by using deductive reasoning that proceeds from the defining axioms or from previously established theorems.

Conceptual Structure of the Material:

Starting from simple mathematical notions such as integers and sets, we proceed to transformations and permutations in order to arrive at the concept of a group, an abstract structure with one basic operation. From the simple and concrete we step to the complex and abstract. After characterizing various groups and relations between them we turn to the investigation of their inner structures, gaining a complete characterization of finite Abelian groups. We continue with another abstract structure, the ring, which has two basic operations. Again, our understanding follows a line from lower to higher complexities. Many properties of groups are generalized to rings. Commonly used mathematical objects as polynomials and matrices will be investigated as special instances of rings.

Format/Activities in the Class:

You are expected to attend each class. Learning mathematics requires that you study and practice mathematics every day. Dialogue and cooperative learning are encouraged. Please, make an effort to come to the board frequently and share your solutions. You will learn clear communication (in written and oral) of your ideas.

All students will do **two short individual presentations** during the semester. You can either present a couple Homework problems (5~10 mins) or s project presentation (5~10 mins) on an abstract algebra topic as approved by instructor. Submit your work using *LaTeX* after your presentation.

Tentative Schedule:

Weeks 1 – 4   Sections 1-5
Weeks 5 – 8   Sections 5-8
Week 9   Fall Break (Oct. 9-13, 2023)
Weeks 10 – 13   Sections 9-15
Weeks 14 – 17   Sections 16-20
(This is a tentative schedule, and is subject to change, should a topic require more or less time in class)

Tentative Quiz/Test Schedule:

Test 1: Sept. 18 (Wed)
Test 2: Nov. 6 (Wed)
Final Exam (Cumulative) Dec. 11 (Wed) 2:00am – 3:50pm

Quiz 1: Sep. 4 (Wed)
Quiz 2: Oct. 16 (Wed)
Quiz 3: Nov. 27 (Wed)

Evaluation:
The grade distribution and grading scheme are as follows:

    Quizzes 30%   Tests 40%   Final Exam 20%   Presentations 10%

 Grading Scale:

    98-100%: A+   93-97%: A   90-92%: A-   87-89%: B+   83-86%: B

    80-82%: B-   77-79%: C+   70-76%: C   60-69%: D   0-59%: F

Student's work is usually graded on a partial credit basis. **Students' written solutions must include all work needed to solve problems**. Points will be deducted (or given none) for omitting any work even if the answer is correct.

Quiz:
Quizzes will be generated from homework and lecture notes. Your **one** **lowest grade** will be dropped for your final grade evaluation.

Homework:
Homework will be assigned to each class. To be successful, a student must complete all assigned homework even if it is not collected and graded. Keep in mind that tests are based on homework problems, so practice, practice, practice!

Exams/Final Exam:
There will **be two tests** and **a cumulative final exam**. All notes and the textbook are prohibited from use on exams and on the final exam. It is crucial to do well on Tests and Final Exam. Missing any single test or final exam will result in grade F. Very special circumstances will be handled very specially by consultation with the instructor. Except for true emergencies, these special cases are arranged in advance with the instructor.

> **Any evidence of cheating will result in a "0" for that test/Final exam and an "F" for the entire course regardless of your total points!!!**

Attendance:
Students are expected to attend every scheduled class. It is the students' responsibility to keep informed of any announcements, syllabus adjustments or policy changes made during scheduled classes. In case you must leave early, you need to inform the instructor in advance about your leaving class early. Please inform the instructor if you will be absent.

Make-up policy: There will be no make-up quizzes/tests unless you contact the instructor **IMMEDIATELY** for extenuating circumstances. For example, you must go off-island, you will be hospitalized or under serious medical treatment, deployment, etc.

Withdrawal from Class: [*UOG Student Handbook, p.33-34*]
Students may withdraw from a class or classes during the first week of instruction of a regular semester and the first two days of a summer session without anything being recorded on their transcripts. From

the second through the eighth week of instruction of a regular semester and from the third day of classes through the third week of a summer term, students may withdraw by using the Withdrawal feature in their Webadvisor account.

Academic Dishonesty:

All assignments and Quiz/Test/Exam must be your own work. The term plagiarism includes, but is not limited, to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials. Plagiarizing in your essay or **CHEATING on Quiz/Test/Exam will result in Course Grade F regardless of your total points.** If you are not sure what plagiarism is and how to avoid it in using sources for your work, see www.indiana.edu/~wts/pamphlets/plagiarism.shtml but be careful when paraphrasing not to change the meaning of scientific information. Answers you write on Quiz/Test/Exam must come only from in your head or the information supplied in the test papers; anything else is cheating. The term cheating includes, but is not limited to: (1) use of any unauthorized assistance in taking quizzes, tests, or examinations, e.g., looking at other students answers, using crib notes (including electronic), getting information from another person via any kind of communication; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or (3) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff. If you need to use an electronic translator, you must discuss this with me in advance.

STUDENT LEARNING OBJECTIVES AND MA411 CURRICULAR MAPPING:

After completing the course, successful students will be able to:
- o   MA 411 SLO1 – determine and verify whether a given abstract structure is a group, a ring or neither of the two;
- o   MA 411 SLO2 – and apply the different ways of obtaining new structures from given one like taking subgroups, subrings, subfields, or forming direct sums/products;
- o   MA 411 SLO3 – solve problems with concrete groups like cyclic groups and permutation groups by applying the intrinsic properties of these groups;
- o   MA 411 SLO4 – compare algebraic features of mathematical systems through the use of homomorphism and isomorphism;
- o   MA 411 SLO5 – prove general statements, about properties of groups and rings by using deductive reasoning that proceeds from the defining axioms or from previously established theorems.

Mathematics Program Learning Outcomes (PLOs):

Students completing the mathematics program at the UOG will:

MA PR PLO1 – demonstrate critical thinking, problem solving skills and ability to *use* mathematical methods by identifying, evaluating, classifying, analyzing, synthesizing data and abstract ideas in various contexts and situations;
MA PR PLO2 – exhibit a sound conceptual understanding of the nature of mathematics, and *demonstrate* advanced mathematical skills in mathematical analysis, modern algebra and other mathematical discipline(s);
MA PR PLO3 – argue and *reason* using mathematics, read, *create* and *write* down logically correct mathematical proofs, *use* exact mathematical language and *communicate* mathematics efficiently orally, in writing and using information technology tools; *MA PR PLO4 – apply* abstract thinking, mathematical methods, models and current practices in the sciences, including state-of-the-art mathematical software, to solve problems in theoretical mathematics or in a diverse area of mathematical applications;
MA PR PLO5 – show maturity in mathematical knowledge and thinking that prepares and encourages students to pursue graduate studies in mathematics or in related fields;
MA PR PLO6 – demonstrate an appreciation of and enthusiasm for inquiry, learning and creativity in mathematical sciences, a sense of exploration that enables them to pursue lifelong learning and up-to-date professional expertise

in their careers through various areas of jobs, including governmental, business or industrial jobs in mathematics, related sciences, education or technology.

UOG Institutional Student Learning Outcomes (ILOs):

For more information about the following ILOs, please refer to www.uog.edu/adminstration/academic-and-student-affairs/accreditation/assessment-and-program-review.

ILO-1   Mastery of critical thinking and problem solving
ILO-2   Mastery of quantitative analysis
ILO-3   Effective oral and written communication
ILO-4   Understanding and appreciation of culturally diverse people, ideas and values in a
         democratic context
ILO-5   Responsible use of knowledge, natural resources, and technology
ILO-6   An appreciation of the arts and sciences
ILO-7   An interest in personal development and lifelong learning

Curriculum Mappings:

	MA PR PLO1	MA PR PLO2	MA PR PLO3	MA PR PLO4	MA PR PLO5	MA PR PLO6
MA 411 SLO1	x	x				
MA 411 SLO2	x	x				
MA 411 SLO3	x	x	x	x		
MA 411 SLO4	x	x	x	x	x	x
MA 411 SLO5	x	x	x	x	x	x

	UoG ILO1	UoG ILO2	UoG ILO3	UoG ILO4	UoG ILO5	UoG ILO6	UoG ILO7
MA PR PLO1	x	x					
MA PR PLO2	x	x					
MA PR PLO3	x	x	x				
MA PR PLO4	x	x	x			x	
MA PR PLO5					x	x	
MA PR PLO6					x	x	x

Academic Integrity Policy:

Academic Integrity is about performing in your role as student in ways that are honest, trustworthy, respectful, responsible, and fair (see www.academicintegrity.org for more information). As a student, you will complete your academic assignments in the manner expected by the instructor. Academic dishonesty, including but not limited to cheating and plagiarism may result in suspension or expulsion from the University. Refer to the UOG Student Handbook and Code of Conduct for more information.

COVID Statement

The University of Guam is experiencing continued disruption to delivery of instruction during the global coronavirus pandemic. The University will follow executive orders and may be forced to close again, causing more modifications as the semester progresses. All changes will be posted on the UOG website, www.uog.edu.

- Contact OIT for technical support at 735–2630 or oit@triton.uog.edu
- Contact the Triton Advising Center at 735–2271 or tac@triton.uog.edu
- Contact Isa Psychological Services center at 735–2883 or isa@triton.uog.edu

In face-to-face courses, wearing masks and social distancing is required. Anyone who has a fever, or any other symptom, should stay home. If you do not comply with these directions, you will be asked to leave, and if you do not, class will be cancelled. Patience, respect, and cooperation are needed from all of us to persist through these uncomfortable times.

No Recording Policy
Recording of online class meetings is not allowed. Not only is the delivery of course content the intellectual property of the instructor, but students enrolled in the course have privacy rights. Unauthorized recording and distribution of online courses may violate federal law.

UOG Disabilities Policy
For individuals covered under the ADA (Americans with Disabilities Act), if you are a student with a disability requiring academic accommodation(s), please contact the Disability Support Services Office to discuss your confidential request. A Faculty Notification letter from the Disability Support Services counselor will be provided to me. To register for academic accommodation, please contact or visit Sallie S. Sablan, DSS counselor in the School of Education, office 110, disabilitysupport@triton.uog.edu or telephone/TDD 671-735-2460.
Office Hours: Monday to Thursday 9:00-noon and 1:00-3:00; Friday by appointment only
To schedule an appointment at https://calendly.com/sssablan, Office: School of Education, room 110
Office Phone Number/TTY: 735-2460,   Email address: sssablan@triton.uog.edu
Disability Support Services email: disabilitysupport@triton.uog.edu
Scheduled appointments preferred.

Tobacco-free/Smoke-free/Vaping-free campus:
UOG is a tobacco-free/smoke-free, vaping/e-cigarette free campus. Thank you for not using tobacco products or e-cigarettes on campus, for helping to fight cancer, and for helping make UOG a healthy learning and living environment.

Notification of Rights Under FERPA:
The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights for students, parents and school officials can be viewed at
http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html