

Syllabus for MAS 4301 Algebraic Structures, Class Number 11572, Spring 2024

Book: P. Aluffi, “Algebra: Chapter 0”, GSM Volume 104, AMS, ISBN 978-0-8218-4781-7

This is the first from the sequence of (advanced modern) Algebra courses at FIU. It covers the standard material on the basic algebraic structure: algebraic groups. The book we are using has a non-standard aspect: the presentation in it is based on the language of (rudimentary) Category Theory. This aspect not only makes the book unique, but also puts the presentation on modern setting giving a right perspective into understanding the concepts studied there.

The language of Category Theory needed in the course is developed in Chapter 1 and is illuminated by examples of the most important category: the category of sets. This chapter is accessible to any student who has passed the exam on Introduction to Advanced Mathematics (MAA 3200) in the form it is taught at FIU. One of the most important concepts for us here is the concept of terminal object of a category (initial or final). This concept will allow us make the “right” definitions, based on universal properties, further in the course.

Chapter 2 is devoted to the “elementary” theory of groups. All the related classical theorems are proved here, but the exposition is enriched by the categorical viewpoint. The category of groups is introduced and discussed in considerable details throughout the chapter. The study of groups includes also the theory of the symmetric groups culminating in proving the simplicity of the alternating groups of order bigger than 12. This material is contained in section 4 of Chapter 4.

The book suggests numerous very carefully chosen exercises and problems. We will make some of them an inseparable part of the course (via homework assignments and exams).

Assessment of students' knowledge: The overall grade will be based on the results on several Quizzes, Turn-in Homework Assignments, Midterm, and Final Exam. All the problems for the exams will be taken from the ones given for work at home during the Semester. The novelty here is that, on the exams, the students might be asked to give proofs of selected theorems from the course. The overall grade will be based on 15% of the Turn-in homework's total score, 15% of the total Quizzes' score, 30% of the total of the Midterms' scores, and 40% of the Final Exam score. The scale for the overall grades follows:

Example: Suppose a student has A points total on the HW, B points total on the Quizzes, C points total on the Midterm Exams, and D points on the Final Exam. Suppose further that the maximal possible points one can get on these are A', B', C', and D' respectively. Then, one can compute a number S by the formula

$$S = [15*A + 15*B + 30*C + 40*D] / [15*A' + 15*B' + 30*C' + 40*D'].$$

The overall grade of the student above is determined now by the scale:

$0.92 < S$:A	$0.89 < S < 0.92$:A-	$0.86 < S < 0.89$:B+
$0.78 < S < 0.86$:B	$0.75 < S < 0.78$:B-	$0.71 < S < 0.75$:C+
$0.62 < S < 0.71$:C	$0.58 < S < 0.62$:C-	$0.55 < S < 0.58$:D+
$0.49 < S < 0.55$:D	$0.46 < S < 0.49$:D-	$S < 0.46$:F

Note: No make-up exams will be scheduled.

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Important remark: The Instructor reserves the right to make any changes he considers academically advisable. Any such changes will be announced in advanced in class or by posting them to the e-mail accounts of the students. The students are responsible to be aware of the changes announced this way.