# Introduction to Algebra (MATH 311 / MATH 572)
Sabancı University, Spring 2022

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## Course content

**Groups:** definitions and examples, subgroups, cosets, cyclic groups, permutation groups, direct products, finitely generated abelian groups, homomorphisms, isomorphism theorems, group actions, and applications.
**Rings and Fields:** rings, fields, integral domains, polynomial rings, factorisation, prime ideals, maximal ideals, field extensions, algebraic extensions, finite fields.

## Background and references

The course is meant as a gentle introduction to abstract algebra and is aimed at students who have until now been inexperienced with the subject. Students enrolled in the course are expected to have basic knowledge of Linear Algebra and Discrete Mathematics.

There are two references for the course.
[1] Michel Lavrauw: *Abstract Algebra. An Introduction.* Available from SUCourse.
[2] John B. Fraleigh: *A First Course in Abstract Algebra.* Available from
   `https://www.homerbooks.com/urun/first-course-in-abstract-algebra`
The lectures closely follow reference [1], which was written for this course, and will be made available via SUCourse. Reference [2] is optional. While most topics treated in the course can also be found in [2], it mainly serves the course through the additional historical notes about certain topics and the additional exercises.

## Objectives

On successful completion of this course, students should be able to:

- develop an understanding of the value of studying abstract algebraic structures, which appear in different settings;

- demonstrate knowledge of groups, rings, fields, their substructures, their quotient structure, and the mappings between them;

- demonstrate the ability to understand and outline proofs of major theorems covered in this course;

- demonstrate the ability to apply basic ideas of abstract algebra in computations and proofs;

- demonstrate the ability to reason abstractly in exploring concepts covered in this course.

## Performance assessment

- Students are expected to attend all lectures. If for some reason this is not possible, then the lecturer should be informed before the start of the lecture. (This does not apply to students who have received a time conflict approval.) All students are responsible for all the communications about the course (exams, homeworks, assignments, etc...) which are made during the lectures.

- Homework exercises and assignments will be published on SUCourse on a regular basis. Solutions will not contribute towards the final grade but it is highly recommended that the students work on these.

- There will be one midterm exam (30%) and one final exam (70 %), further details of which will be announced in the lectures and on SUCourse.