Summary
Study basic concepts of modern algebra: groups, rings, fields.

Content
- Algebraic structures: sets, groups, rings, fields.
- Groups. Subgroups. Homomorphisms of groups, normal subgroups, quotients. Cyclic groups, symmetric groups. Classification of finite abelian groups.
- Examples of rings. Integers. basic properties. Euler's and Fermat's theorems. Polynomial rings. GCD, unique factorization.
- Fields. Algebraic extensions. Euler's totient function, principal ring, factorial ring, field, finite field, characteristic of a field.

Keywords
Group, homomorphism, subgroup, normal subgroup, quotient group, cyclic group, symmetric group, order of the group, order of an element, ring, ideal, principal ideal, prime ideal, maximal ideal, unique factorization, Euler's totient function, principal ring, factorial ring, field, finite field, characteristic of a field.

Learning Prerequisites

Required courses
Linear Algebra I, Analyse I

Recommended courses
Linear Algebra I, Analyse I, Analyse II

Learning Outcomes
By the end of the course, the student must be able to:

• Apply concepts and ideas of the course
• Reason rigorously using the notions of the course
• Choose an appropriate method to solve problems
• Identify the concepts relevant to each problem
• Apply concepts to solve problems similar to the examples shown in the course and in problem sets
• Solve new problems using the ideas of the course
• Implement appropriate methods to investigate the structure of a given group, ring or field, and study their properties

Teaching methods
Lectures and exercise sessions

Assessment methods
Written exam

Supervision
Office hours No
Assistants Yes
Forum No

Resources
Bibliography

Ressources en bibliothèque
• Undergraduate Algebra / Lang
• Abstract algebra / Dummit
• A Concrete Introduction to Higher Algebra / Childs

Moodle Link
• https://moodle.epfl.ch/course/view.php?id=15441