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.

Keywords
Group, homomorphism, subgroup, normal subgroup, quotient group, cyclic group, symmetric group, order of the group, order of an element in the group, finite abelian groups. Ring, ideal, principal ideal, maximal ideal, unique principal ideal domain, Euler's totient function, 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
Three short in-class tests (15% of the grade)
Written exam (85 % of the grade)

Supervision
Office hours No
Assistants Yes
Forum No

Resources
Bibliography

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

Notes/Handbook
Complete lecture notes will be available in PDF

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