

## The Department of Mathematics

2022–23–A term

**Course Name** Algebraic Structures

**Course Number** 201.1.7031

**Course web page**

<https://math.bgu.ac.il/en/teaching/fall2023/courses/algebraic-structures>

**Lecturer** Prof. Ilya Tyomkin, <tyomkin@bgu.ac.il>, Office 213

**Office Hours** <https://math.bgu.ac.il/en/teaching/hours>

### Abstract

### Requirements and grading<sup>1</sup>

### Course topics

- Groups as symmetries. Examples: cyclic, dihedral, symmetric and matrix groups.
- Homomorphism. Subgroups and normal subgroups. Quotient groups. Lagrange's theorem. The isomorphism theorems. Direct products of groups.
- Actions of groups on sets. Cayley's theorem.
- Group automorphisms.
- Sylow's theorems. Application: classification of groups of small order.
- Composition series and Jordan–Hoelder theorem. Solvable groups.
- Classification of finite abelian groups, finitely-generated abelian groups.
- Symmetric group and alternating group. The alternating group is simple.
- Rings, maximal and prime ideals, integral domain, quotient ring. Homomorphism theorems.

---

<sup>1</sup>Information may change during the first two weeks of the term. Please consult the webpage for updates



- *Multilinear algebra*: Quotient spaces. Tensor products of vector spaces. Action of  $S_n$  on tensor powers. Exterior and symmetric algebras. Multilinear forms and determinant.
- *Optional topics*: group of symmetries of platonic solids, free groups, semidirect products, representation theory of finite groups.