MATH-311

# Rings and modules

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| Cursus | Sem. | Type |
|---|---|---|
| Mathematics | BA5 | Opt. |

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|---|---|
| Language of teaching | English |
| Credits | 5 |
| Session | Winter |
| Semester | Fall |
| Exam | Written |
| Workload | 150h |
| Weeks | 14 |
| **Hours** | **4 weekly** |
| Courses | 2 weekly |
| Exercises | 2 weekly |
| **Number of positions** | |


## Summary

The students will solidify their knowledge of algebra. They will use the structure theorem of finitely generated modules over principal ideal domains. We will study simple, indecomposable, projective and injective modules. We will construct their tensor products and localization.


## Content

-definition of modules and module homomorphisms
-simple and free modules
-exact sequences
-injective and projective modules
-tensor products
-Noetherian rings and modules
-structure theorem
-Jordan normal form
-localization of rings
-towards Hilbert Nullstellensatz

## Learning Prerequisites

### Required courses

- Linear algebra
- Théorie des groupes
- Anneaux et corps

## Learning Outcomes

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

- Manipulate modules over rings.
- Distinguish between properties of modules.
- Characterize finitely generated modules over a PID.
- Analyze exact sequences of modules.
- Apply the structure theorem to Jordan normal form of matrices.

## Teaching methods

ex chatedra course with exercise session

### Assessment methods

written exam; bonus for exercises