

MATH-311

**Rings and modules**

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Cursus	Sem.	Type
Mathematics	BA5	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

The students are going to solidify their knowledge of ring and module theory with a major emphasis on commutative algebra and a minor emphasis on homological algebra.

**Content**

- basic definitions of module theory
- the fundamental theorem of finitely generated modules over a principal ideal domain
- Jordan normal form
- homological algebra
- Hilbert's nullstellensatz
- Krull dimension
- transcendence degree
- localization
- tensor product
- integral extensions
- Noether normalization
- going up theorem
- going down theorem
- primary decomposition

**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 and rings
- Characterize finitely generated modules over a PID.
- Analyze rings and modules

- Apply the main theorems of the class

### **Teaching methods**

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### **Assessment methods**

- 1.) Written final exam.
- 2.) Bonus exercises to be handed in during the semsester, worth up to 30% of the final grade.

### **Resources**

#### **Notes/Handbook**

There will be pdf notes provided for the course.