

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**

The final grade will be assigned based on the cumulative points of the student obtained from handed in homework solutions and from the written exam. The weights of the two parts are:

30% - homework

70% - written exam

Students will have to hand in 1 or 2 homework problems per week.

Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

**Resources****Notes/Handbook**

There will be pdf notes provided for the course.