

MATH-686

**Introduction to geometric representation theory**

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Cursus	Sem.	Type
Mathematics		Opt.

Language of teaching	English
Credits	2
Session	
Exam	During the semester
Workload	60h
<b>Hours</b>	<b>28</b>
Courses	28
<b>Number of positions</b>	

**Frequency**

Every year

**Remark**

Participants are required to solve exercises and present them in class during the whole semester.

**Summary**

This course presents geometric constructions of irreducible representations of semi-simple Lie Algebras and their Weyl groups by means of Springer theory.

**Content**

In this course we study (symplectic) manifolds and algebraic varieties associated with complex semi-simple groups. To goal is to use these geometric objects and in particular their (co)homology to construct irreducible representations of the semi-simple group and its Weyl group.

The main reference for the course is the book "Representation Theory and Complex Geometry" by N. Criss and V. Ginzburg.

The topics we cover include:

- Symplectic geometry
- $C^*$ -actions on algebraic varieties
- Borel-Moore homology
- Springer Resolution
- Weyl group representations
- Universal enveloping algebras
- Hecke algebras

**Note**

By the end of the course, the student must be able to understand basic concepts in geometric representation theory and solve concrete problems about representations of semi-simple algebraic groups.

**Learning Prerequisites****Required courses**

Some background in algebraic geometry, differential geometry and linear algebraic groups.

**Resources****Bibliography**

"Representation Theory and Complex Geometry" by N. Criss and V. Ginzburg.

### Ressources en bibliothèque

- [Representation Theory and Complex Geometry / Criss \(en commande\)](#)