

MATH-429

Lie groups

Michel Philippe

Cursus	Sem.	Type
Ing.-math	MA2, MA4	Opt.
Mathématicien	MA2	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Oral
Workload	150h
Weeks	14
Hours	4 weekly
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

We will discuss the basic structure of Lie groups and of their associated Lie algebras along with their finite dimensional representations and with a special emphasis on matrix Lie groups.

Content

- Matrix Lie groups, Lie algebras and the exponential map. Exemples.
- Morphisms of Lie groups and morphisms of Lie algebras.
- Representations theory of compact groups: the Peter Weyl theorem.
- Representations of compact Lie groups and compact Lie algebras
- Representations of Lie groups and their Lie algebras via Weyl's unitary trick

Keywords

Lie groups, Lie algebras, Classical groups

Learning Prerequisites**Required courses**

MATH-211

Recommended courses

MATH-302

MATH-303

MATH-322

MATH-319

Learning Outcomes

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

- Define the main concepts introduced in the course
- state the theorems covered in the course and give the main ideas of their proofs
- apply the results covered in the course to examples
- deduce properties of a Lie group from the structure of its Lie algebra

Teaching methods

ex-cathedra teaching, exercise classes

Expected student activities

- Participation to the course the course
- Active participation to the exercise sessions and to the resolution of exercises

Assessment methods

Assignments, oral exam

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

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Bibliography

"Introduction to Smooth Manifolds", John M. Lee

"Introduction to the Theory of Lie Groups", Roger Godement

"Matrix Groups: An Introduction to Lie Group Theory", Andrew Baker

"Lie Groups", Daniel Bump

"Lie groups, beyond an introduction", Anthony Knapp

Ressources en bibliothèque

- [Introduction to Smooth Manifolds / Lee](#)
- [Lie groups, beyond an introduction / Knapp](#)
- [Lie Groups / Bump](#)
- [Introduction to the Theory of Lie Groups / Godement](#)
- [Matrix Groups / Baker](#)

Moodle Link

- <https://go.epfl.ch/MATH-429>