MATH-534

Representation theory III - Quantum groups

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

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	During the semester
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Remark

Pas donné en 2026-27 - Cours donnés en alternance tous les deux ans

Summary

This course serves as an introduction to the theory of quantum groups, with particular emphasis on using their R-matrices to obtain link invariants.

Content

This is a third semester course in representation theory, which succeeds the theory of semisimple Lie algebras. We will define quantum groups as deformations of Lie algebras, and construct R-matrices for quantum groups using the formalism of Hopf algebras. Using these R-matrices, we will obtain invariants of links, such as the celebrated Jones polynomial that arises from the case of sl_2.

Keywords

Quantum groups, Hopf algebras, R-matrices, Yang-Baxter equation, link invariants

Learning Prerequisites

Required courses

MATH-429 Representation theory II - Lie algebras, or equivalent

Learning Outcomes

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

- Formulate the main concepts and theorems defined in the course
- Theorize the role of quantum groups in the theory
- Compute R-matrices for simple quantum groups

Expected student activities

Students are expected to attend all lectures, read all lecture notes and participate in all problem sessions

Assessment methods

Weekly homework (100%)

Supervision

Assistant.e.s	Yes
Forum	Yes

Resources

Bibliography

C. Kassel, "Quantum groups"

Ressources en bibliothèque

- Find the references at the Library

Moodle Link

- https://go.epfl.ch/MATH-534