UNIVERSITY OF GOTHENBURG

DEPARTMENT OF MATHEMATICAL SCIENCES

NFMV022 Lie groups, Lie algebras and representations, 7.5 credits

Liegrupper, Liealgebror och representationer, 7,5 högskolepoäng

Third-cycle level / Forskarnivå

Confirmation

This syllabus was confirmed by the Department of Mathematical Sciences on 2022-05-20, and is valid from Spring semester 2022.

Responsible Department
Department of Mathematical Sciences, Faculty of Science

Participating Department/s
Department of Mathematical Sciences

Entry requirements

Linear and multi-linear algebra. Real Analysis, Functional Analysis. Higher differential calclus. Elementary differential geometry.

Learning outcomes

Basis theory of Lie groups and Lie algebras. Nilpotent and simple Lie algebras. Theory of root systems and Dynkin diagrams. Examples of important representations of elementary Lie groups. Peter-Weyl theorem and examples.

Knowledge and understanding

Relation between Lie groups and Lie algebras. Structure of simple Lie algebras. Relation between root systems and reflection groups. Constructions of representations of Lie groups and Lie algebras.

Competence and skills

After passing the course, the student will master: Algebraic techniques on Weyl groups. Techniques to construct representations and to study representations using root systems.

Analytical methods to study unitary representations on L2-spaces.

Course content

Introduce the general theory of Lie algebras and Lie groups. Classification theory of complex semisimple Lie algebra, root systems and Dynkin diagrams. Weyl groups. Irreducible representations of complex simple Lie algebras and compact Lie groups. Peter-Weyl theory.

Types of instruction

Lectures; 2 lectures of 2 hours per week, totally 8 weeks.

Language of instruction
The course is given in English.

Grades

The grade Pass (G) or Fail (U) is given in this course.

Types of assessment

Homework and oral examination.

Course evaluation

Continuous discussions with course participatants. Evaluation in the end of the course.