Course Description:
The importance of Lie algebras derives from their relation to Lie groups. A Lie group is a group and a manifold, such that the group operations are smooth maps. They often arise as symmetry groups in physics and mathematics. The group $SO(n)$ of rotations in $\mathbb{R}^n$ is such an example. Lie algebras, the topic of this course, in turn are “linearisations” of Lie groups, or “infinitesimal symmetry transformations”. They consist of a vector space together with a bilinear operation, the Lie bracket. Surprisingly, many of the properties of Lie groups can derived from these linearisations. We will study:
- definition and basic properties of Lie algebras,
- nilpotent and solvable Lie algebras,
- universal enveloping algebra and PBW-basis,
- semisimple Lie algebras: root systems, Dynkin diagrams, classification,
- highest weight representations.

This course is mainly aimed at Masters students in Mathematics and Mathematical Physics.

Prerequisites:
Basic notions from algebra (groups, fields, linear algebra).

Date and Place:  
Tue, 12:15–13:45, Hörsaal H3, Geomatikum  
Fri, 14:15–15:45, Hörsaal H3, Geomatikum

Problem Classes:  
Fri, 16:15–17:45, Hörsaal H3, Geomatikum

Starting on:  
17 October 2023