

李群引论: Introduction to Lie groups

Tuesday 15:55–17:30, Friday 14:00–15:35

Teaching building 5, room 5307

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Knowledge of Lie groups is essential for anyone working in geometry or physics. This course gives an introduction to Lie groups, Lie algebras and representation theory. We will cover the basic theory and examples of Lie Groups and Lie algebras, the theory of compact groups, root systems and classification of complex semisimple Lie algebras, and highest weight representations. I won't presuppose any previous knowledge of Lie groups. We will spend some time on foundational material but only as needed to get to the important topics of compact Lie groups and semisimple Lie algebras.

The prerequisites are some knowledge of differential geometry and manifolds. But the differential geometry and smooth manifold theory needed can be learned simultaneously. So the course should be accessible to a beginning graduate student with some knowledge of those subjects.

Grading:

I will give some problem sets which will be the basis for your grade. I will post problems and announcements on the above web page.

Main reference:

- Anthony W. Knap, *Lie Groups Beyond an Introduction*, 2nd edition, Progress in Math., 2002, 812 pp.

We will cover roughly chapters 1,2,4 and 5. Don't let the title discourage you. No previous knowledge of Lie groups is needed to read it.

Recommended reading:

- Theodor Bröcker and Tammo tom Dieck, *Representations of Compact Lie Groups*, Springer-Verlag, GTM 98, 1985, 313 pp.
- William Fulton and Joe Harris, *Representation Theory, a First Course*, Springer-Verlag, GTM readings in math., 1991, 140 pp.

Bröcker and Dieck is a good source for those interested in compact groups. Fulton and Harris is a good source with many examples of finite dimensional representation theory using mainly the theory of Lie algebras.