

# Math 535: Real Groups (Lie Theory II)

## Spring Term, 2017

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v1.0 (January 2, 2018)

Course Website	<a href="http://www.math.ubc.ca/~lior/teaching/1718/535_W18/">http://www.math.ubc.ca/~lior/teaching/1718/535_W18/</a>
Contact me at	MAT 229B — 604-827-3031 – <a href="mailto:lior@math.ubc.ca">lior@math.ubc.ca</a>
My Website	<a href="http://www.math.ubc.ca/~lior/">http://www.math.ubc.ca/~lior/</a>
Class	W 11:00-12:00, F 10:00-12:00, MATX 1118
Office Hours	W 10:00-11:00 and by appointment
Textbook	None required; see below for recommendations
(Informal) Prerequisites	Group theory, Lie algebras, point-set topology, functional analysis

### About the course

This will be a graduate course on the structure and representation theory of Lie groups. The course will have four parts:

1. Topological groups, representation theory, and the Peter–Weyl Theorem.
2. Lie groups: basic definitions and differential geometry
3. Compact Lie groups: maximal tori, roots and weights, representation theory, Weyl character and integration formulae.
4. Real Lie groups: Lie algebras, Poincaré–Birkhoff–Witt, Cartan subalgebras, roots and weights, parabolic subgroups, introduction to infinite-dimensional representations.

The main pre-requisites are basic algebra (rings and fields, rings of polynomials, unique factorization in Euclidean domains), basic number theory (modular arithmetic, factorization into primes) and Galois Theory, but no specific courses are required.

### Textbooks

There are many books titled “Algebraic Number Theory”; you can use any for your own reference. I personally use Lang but if you plan to buy one book make it Neukirch which is more comprehensive and has exercises. Both Lang and Neukirch are available for free download through UBC’s subscription to SpringerLink (links are available on the course website).

### Evaluation and grading

The grade will be based on up to six regular problem sets. There will be no final exam.

## References

- [1] Bröcker–tom Dieck, *Representations of Compact Lie Groups*
- [2] Knapp, *Lie Groups Beyond an Introduction*
- [3] Knapp, *Representation Theory of Semisimple Groups: An Overview Based on Examples*