

Course Syllabus—Math 854—Autumn 2008

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Office Hours: M 12:45-2:15p, W 4:30-6:00p, Th 10:30a-12:00n, by appt.
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Course Information

Course #/Title: Math 854—Lie Groups I (Abstract Lie Algebras)
Lecture Times/Location: MWF—0330p University Hall (UH) 0090

Course Description: A discussion of abstract Lie algebras including their structure theory, classification, and representations.

Text: While there is no required text for this course we have the following list of recommended texts:

1. Humphreys, James E. *Introduction to Lie Algebras*, Graduate Texts in Mathematics, **9**, Springer, ISBN 0-387-90053-5.
2. Fulton, William and Joe Harris. *Representation Theory: A First Course*, Graduate Texts in Mathematics, **129**, Springer, ISBN 0-387-97495-4.
3. Hall, Brian. *Lie Groups, Lie Algebras, and Representations*, Graduate Texts in Mathematics, **222**, Springer, ISBN 978-0-387-40122-5.
4. Erdmann, Karin and Mark J. Wildon. *Introduction to Lie Algebras*, Springer Undergraduate Mathematics Series, Springer, ISBN-13: 978-1-84628-040-5.
- *5. Stewart, Ian. *Lie Algebras*, Lecture Notes in Mathematics, **127**, Springer-Verlag.
- *6. Serre, Jean-Pierre. *Lie Algebras and Lie Groups*, Lecture Notes in Mathematics, **1500**. Springer-Verlag.

The * texts are available online at www.springerlink.com through the Ohio State Library website.

Grading: Your grade for the quarter will be based on several (perhaps 5 or 6) homework assignments and a take-home final exam. Instead of having a set point value for each assignment, we will instead set each problem from the quarter to be 10 points.

Grading will be based on a percentage of total points. The course will approximately use the standard cutoffs: A (90-100%), B (80-89%), C (70-79%), D (60-69%) and F (below 60%). However, cut-offs may drop if the difficulty level of the course warrants such an adjustment.

Course Topics: The following is a list (not necessarily inclusive) of topics to be covered this quarter.

1. Motivation for studying Lie algebras and basic theory.

2. Structure theory, ideals, centers.
3. Nilpotent Lie algebras, Engels' Theorem, lower central series.
4. Solvable Lie algebras, Lie's Theorem, Cartan Criteria, derived series.
5. Semisimple theory, including simple Lie algebras and radicals.
6. Representation theory, roots and weights, $\mathfrak{sl}_2(F)$ and $\mathfrak{sl}_3(F)$.
7. Classifying simple Lie algebras, Cartan subalgebras, Jordan decomposition.
8. Root systems, dominant weights, Weyl groups.

Final Examination: The final exams will be due by Thursday, December 11 at 5:30pm.

Disability Services: Students with disabilities should register with the Office of Disability Services. They are located in Pomerene Hall (PO) 150 and can be reached at (614) 292-3307. Students should also meet with the instructor privately to discuss their situation so that appropriate arrangements can be made to accommodate the student.

Important Dates: Friday (10/10) is the last day to drop the course without receiving a "W". Friday (11/17) is the last day to drop the course without petitioning. Anyone enrolled after November 17 will receive a letter grade for the course.