

# Lie Groups and Lie Algebras

## Math 199B—Winter 2018

Bernard Russo

January 11, 2018

- **Course:** Mathematics 199B Course Code 45351  
Fridays 4-4:50 RH340P (in the Math Dept. offices)
- **Course objective** To understand the background in Lie Groups and Lie Algebras for the purpose of studying their generalizations to Coquecigrues and Leibniz algebras (the latter will be carried out in Math 199C in Spring 2018)
- **Text: Introduction to Differential Geometry** (on the class website)  
by Joel W. Robbin and Dietmar A. Salamon  
available at <https://people.math.ethz.ch/~salamon/PREPRINTS/diffgeo.pdf>  
(If this doesn't work, google dietmar a salamon  
and on his homepage scroll down to Lecture courses)
- **Course procedure:** The class will meet for one hour per week. Students will study the portion of the text which will be assigned for each meeting, according to the following schedule:  
**Week 1** Coordinates (1.2 pp 4-7)  
**Week 2** Smooth Manifolds (1.4 pp 10-12)  
**Week 3** Submanifolds of Euclidean Space (2.1 pp 15-23)  
**Week 4** Tangent Spaces (2.2 pp 24-28)  
**Week 5** Derivatives (2.2 pp 29-32)  
**Week 6** Submanifolds and Embeddings (2.3 pp 33-36)  
**Week 7** Vector Fields (2.4 pp 37-43)  
**Week 8** Flows (2.4 pp 44-50)  
**Week 9** Lie Groups (2.5 pp 51-53)  
**Week 10** The Lie Algebra of a Lie Group (2.5 pp 54-64)
- **Instructor:** Bernard Russo RH525 Office Hours TBA
- **Homework:** Reading and Exercises will be assigned.
- **Grading:** There are no midterms or final. Grading for 2 units will be based on your solutions to selected exercises. For 4 units you will also need to report on a paper on Leibniz algebras.