<u>Marco Zambon</u>
<u>Metodos Matematicos da Fisica</u>
<u>Fall 2009</u>

SUMARIO

PART 1: SYMPLECTIC GEOMETRY

22 Sept Physical motivation to symplectic geometry: classical mechanics
24 Sept Symplectic linear algebra: symplectic vector spaces and their subspaces
29 Sept Symplectic linear algebra (cont): coisotropic reduction
1 Oct   Exterior linear algebra.
6 Oct   Review of geometric notions in R^n: submanifolds, vector fields
8 Oct   Symplectic geometry in R^n: Darboux's theorem, Poisson brackets
13 Oct   Hamiltonian mechanics Noether's theorem
15 Oct   Constrained mechanical systems, systems with symmetry
20 Oct   Symplectic geometry on manifolds. The cotangent bundle. Weinstein's tubular neighborhood theorem.

PART 2: REPRESENTATION THEORY

22 Oct   Group actions, semidirect products
27 Oct   Lie groups
29 Oct   Lie groups representations, irreducibility.
3 Nov   Theorem: complex irreducible representations of abelian groups are 1-dimensional
5 Nov   Compact Lie groups. Theorem: Unitary representations of compact Lie groups are completely reducible.
10 Nov   Characters. Schur's lemma.
12 Nov   Classification of irreducible representations of compact Lie groups by their characters.
17 Nov   The Lie algebra of a Lie group, adjoint actions.
19 Nov   Relation between the Lie group and Lie algebra representations
24 Nov   Representations of SU(2) and S^1
26 Nov   Complexification of Lie algebra representations
1 Dec   Highest weights, classification of representations of SU(2)
3 Dec   Tensor product of representations, Clebsch-Gordon decomposition
10 Dec   Killing form on Lie algebras, semisimple Lie algebras
15 Dec   Cartan subalgebras, Root space decompositions, Dynking diagrams
17 Dec   On the classification of representations of semisimple complex Lie algebras.