# TOPICS IN LIE GROUPS COURSE

1. Definition of Lie groups, manifold structure of matrix groups, the matrix exponential as a local chart on certain matrix groups.

2. Left invariant vector fields on a Lie group, vector bundle formulation of left invariant vector fields (page 14 BD), Lie brackets of vector fields, the Lie algebra of a Lie group, Lie algebras of immersed Lie subgroups of a Lie group.

3. Lie algebra of $Gl(n)$ and its Lie subgroups.

4. Lie homomorphisms of Lie groups and the corresponding homomorphisms of Lie algebras.

5. Left invariant differential forms on a Lie group, the Maurer-Cartan form, the Maurer-Cartan structure equation.

6. The flow of a left invariant vector field, one-parameter subgroups of a Lie group (notes and pages 16,17 BD).

7. The adjoint representation of a Lie group (notes and page 18 BD).

8. The exponential map of a Lie group (notes, page 23 BD).

9. Structure of abelian Lie groups, pages 24-26 BD.

10. Closed subgroups of Lie groups, page 28,29 BD.

11. Lie group actions and principal bundles, pages 30-37 BD , very brief.

12. Invariant integration, pages 41-53 BD.

13. Representation theory of Lie groups, pages 65-93 BD.

14. Compact topological groups, the Peter-Weyl theorem, and its applications, pages 129-138 BD.

15. Generalizations of the Peter-Weyl theorem, pages 139-145 BD.

16. Maximal tori of compact Lie groups and Weyl's integral formula, pages 157-172 BD.