1. **Introduction**
   a. Symmetry in physics
   b. Discrete and continuous symmetries
   c. Symmetry in quantum mechanics

2. **Mathematical Background for Discrete Groups**
   a. Groups
   b. Subgroups
   c. Cosets
   d. Conjugacy classes

3. **Representations of Groups**
   a. Reducible and irreducible representations
   b. Schur’s lemmas and the Great Orthogonality Theorem
   c. Character tables
   d. Direct products and their decomposition

4. **Physical Applications of Discrete Groups**
   a. The group of the Hamiltonian
   b. Eigenfunctions and irreducible representations
   c. Bloch's theorem
   d. Selection rules

5. **Continuous Groups, Lie Groups, and Lie Algebras**
   a. Linear transformation groups
   b. Infinitesimal generators
   c. Algebra of infinitesimal generators

6. **Irreducible Representations of SO(2) and SO(3)**
   a. Orthogonality relations and the density function
   b. Basis functions for irreducible representations of SO(2)
   c. Spherical Harmonics and characters for SO(3)

7. **Unitary Groups**
   a. Unitary groups and particle physics
   b. Basis states for SU(N)
   c. Multiparticle states and direct products
   d. Young tableaux

**Recommended Books**

Basic course material:

Related and advanced treatments:
R. Hermann, *Lie Groups for Physicists* (Benjamin, 1966)