

PHY 635 - Symmetry in Physics

Course Code & Number	Course Name	C.H.	Lec.	Lab.	Tut.
PHY 635	Symmetry in Physics	4	4	0	0

Syllabus

Introduction to symmetries: *The idea of a Symmetry. Symmetries of the square.*

Mathematical preliminaries: *Sets, Maps, and Algebras.*

Discrete Groups: *Finite groups, Dihedral, Cyclic, Permutation, Symmetric groups. Lagrange's Theorem. Cayley's Theorem.*

Matrix Groups and Representation Theory: *Continuous Groups. Matrix groups. Vector Spaces. Representation Theory. Orthogonality Theorem. Schur's Lemmas. Characters.*

Lie Groups and Lie Algebras: *Analyticity. Ininitesimal generators of Lie Groups. $SO(3)$ Lie Algebra.*

Application: *Rotation Symmetry in Quantum Mechanics, Representations of $SO(3)$ and $SU(2)$. Ladder Operators. Hydrogen Atom.*

References

- G. Hooft and M. J. G. Veltman, Lie Groups in Physics, Utrecht University, 2007.
- H. Georgi, Lie Algebras in Particle Physics, Benjamin Cummings, 1982.
- K. Huang, Quarks, Leptons and Gauge Fields, 2nd Edition, World Scientific, 1992.

