SYMMETRY AND GROUP THEORY

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IIT Bombay

INTENDED AUDIENCE: Chemistry.

COURSE OUTLINE:

This course provides a quantitative treatment of symmetry in chemistry, using group theory. We start with determination of point group, discuss transformation matrices, abstract group theory, unitary transformations, derivation of Great Orthogonality Theorem and its consequences leading to character tables. Then, various applications in Chemistry are discussed. It is equivalent to CH 801 of IIT Bombay. The lectures are already recorded by CDEEP, IIT Bombay.

ABOUT INSTRUCTOR:

Prof.Anindya Datta ,Professor of Chemistry in IIT Bombay, with research interest in ultrafast spectroscopy and time resolved fluorescence microscopy. I have teaching experience of 17 years. 14 Ph. D. students have graduated from our laboratory. Eight more are working towards their degree. I received Excellence in Teaching Award from our institute in 2017 and have taught two NPTEL courses: one on Molecular Spectroscopy and another on Symmetry in Chemistry.

COURSE PLAN:

Week 1 : Symmetry elements and operations

Week 2 : Transformation matrices

Week 3 : Know thy matrices

Week 4 : Matrix representations

Week 5 : Juggling with representations

Week 6 : Derivation of Great Orthogonality Theorem

Week 7 : Character tables for cyclic groups

Week 8 : Projection operators

Week 9 : From SALCs to molecular orbitals

Week 10 : Naphthalene: a case study

Week 11 : Ferrocene: a case study

Week 12 : Electronic spectrum of benzene