

# CY242 Introduction to Molecular Spectroscopy

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Credit: 3-0-0-3

Approval: Approved in 2nd Senate

Prerequisite: Chemistry or Physics common course.

Students intended for: B. Tech. 3rd Year

Elective or core: Elective

Semester: Odd/Even

## Course objective:

The course provides an introduction to molecular spectroscopy. Some of the fundamental concepts used in understanding molecular spectroscopy will be discussed in detail. Understanding of these concepts is fundamental in understanding how molecules interact with light. Finally the course provides specific study of the application of molecular spectroscopy to different areas of science.

## Course content:

- Quantum Mechanics (Lecture Hours - 12): Wave-particle duality, Schrödinger wave equation, Operators, Probability density, Matrix elements of operators and expectation values, One-dimensional problems in quantum mechanics - particle in a box, potential well, potential barrier and tunnelling.
- Structure and bonding (Lecture Hours - 16): Hydrogen atom, Helium atom, Hydrogen molecule, Structure and Bonding, Nature of the chemical bond, Donor-Acceptor complexes, Charge transfer, Energy transfer, Conductance through DNA, Molecular electronic circuits, Single molecule transistors, Single molecule logic gates.
- Spectroscopic Techniques (Lecture Hours - 14): Born-Oppenheimer Approximation, Molecular spectroscopy, Selection Rules, Vibrational and Rotational motion, Electronic Absorption and Emission Spectroscopy, Raman Spectroscopy.

## Text & Reference Books:

Molecular Spectroscopy, Jeanne L. McHale, Prentice Hall (1998).

Introductory Quantum Mechanics, R. L. Liboff, Addison-Wesley (2002).

Modern Quantum Chemistry, Attila Szabo, Dover (2000).

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School: Basic Sciences