

First Course Hand-out for CHM636A (Physical Photochemistry)

1. **Units** : 3-0-0 (9)
2. **Prerequisites**: Basic idea of Quantum Mechanics and Group Theory will be helpful
3. **Course Contents**

Introduction, Radiation matter interaction, Term symbols. (4)

Theory of electronic absorption spectra, Beer's law, Absorption cross-section, Selection rules, Solvatochromism (4)

Radiative and non-radiative transitions, Vibrational relaxation, Internal conversion, Inter system crossing (4)

Fluorescence, Phosphorescence, Various photophysical processes, Solvent effect on emission, Lippert equation, Dynamic Stokes shift, Dynamic and static quenching, Stern-Volmer equation, Forster resonance energy transfer and theory, Fluorescence anisotropy and Perrin equation, Excited state proton/electron transfer, Excimer and exciplex (15)

Laser fundamentals, Stimulated emission, Population inversion, Light amplification, Pulsed laser: cavity dumping, Q-switching, mode-locking (4)

Spectroscopic techniques, Spectrophotometer, Spectrofluorimeter, Time correlated single photon counting, Transient absorption, Detectors (4)

Advanced topics including Single molecule spectroscopy, Ultra-fast spectroscopy (5)

4. **Lecture Schedule & Venue**: **Tuesday** (10:35 am- 11:50 am) & **Thursday** (12:00 pm- 1:15 pm) ; **FB-434**
5. **Evaluation Components & Grading Policies**: Mid-Sem (40%) and End-Sem Exams (60%). Additionally, up to two 'Surprise Quizzes' can be there and each quiz will carry 10% weightage to the final marks. If 'Surprise Quizzes' are taken then the marks division for the mid-sem and end-sem will also change as per following scheme.

Mid Sem	40%	Mid Sem	35%	Mid Sem	30%
End-Sem	60%	End-Sem	55%	End-Sem	50%
No Quiz	0%	One Quiz	10%	Two Quizzes	20%

Home assignments will be given but will not be graded.

6. **Books & References**: P. F. Bernath, Spectra of Atoms and Molecules
J. R. Lakowicz, Principles of Fluorescence Spectroscopy
Bernard Valeur, Molecular Fluorescence: Principles and Applications
W. T. Silfvast, Laser Fundamentals