NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPALLI
DEPATMENT OF CHEMISTRY

PAPER-IV Fundamentals of Photochemistry and UV-Vis, Fluorescence Spectroscopy

UNIT-I

Fundamentals of Photochemistry: Jablonski Diagrams Theory of Energy Transfer –Resonance and Exchange Mechanism, Photosensitization and Quenching. Principles of Absorption Spectroscopy, Instrumentation, Presentation of Spectra, The Effect of Conjugation, The Effect of Conjugation on Alkenes, The Woodward- Fieser Rules for Diens, Corbonyl Compounds; Enones, Visible Spectra; Color in Compounds, Absorbing Species Containing P, S, aAnd N Electrons, Charge - Transfer Absorption, General Interactions of Light and Matter, Lambert's (or Bouguer's) Law, The Beer-Lambert Law, Limitations of Beer's Law.

UNIT-II

Mechanistic Organic Photochemistry, Photochemical reactions of Carbonyl compounds, Alkenes, Nitrogen-containing compounds and Aromatic compounds, Photooxygenation and photoreduction, Photochemistry in organized systems, Photochromic compounds, Photocleavable protecting groups and linkers.

UNIT-III

UV and Visible Instrumentation-Light Sources , UV-Vis Detectors , Ultraviolet - Visible Spectroscopy Samples, Colorimetry, Typical UV-Vis Spectrophotometers, Multichannel Spectrophotometer, General Applications, Quantitative Analysis, Rate Measurements, Analysis of Mixtures, Chemical Reaction, Multiwavelength Measurements, Important UV Chromophores, Influence of Auxochromes, Steric Effects, Visible Spectra, Solvents Effect, Applications of Absorption Spectroscopy (UV, Visible), Structure Elucidation Of Organic Compounds, Application in sensor studies, Binding Constant, Stochiometry of complex(Job's Plot).

UNIT-IV

Fluorescence and Fluorescence Spectra, Instrumentation for Fluorescence Spectrophotometry, Radiative Processes of Excited States, An Exception to Kasha's Rule, Fluorescence Quantum Yield, Factors Contributing to Fluorescence Behaviour, Molecular Fluorescence in Analytical Chemistry, Phosphorescence, Delayed Fluorescence, E - Type Delayed Fluorescence (Thermally – Activated Delayed Fluorescence), Triplet - Quenching Studies, Radiative and Nonradiative Decay Pathways.

UNIT V

Factors Affecting Fluorescence Intensity, excitation-emission spectrum, Red Shift, Blue Shift, Lanthanide Luminescence, The Marcus Theory of Electron Transfer, Photoinduced Electron Transfer (PET), Fluorescence Switching by PET, Applications of Fluorescence in The Study Of Biological Structure and Function, Fluorochromes, ESIPT fluorescence, Fluorophore.

Text Books:

1. Rohatgi- Mukherjee K.K "Fundamentals of photochemistry" New age international publishers.

2. Brian Wardle "Principles and Applications of Photochemistry" Manchester Metropolitan University, Manchester, UK.

References:

1. John D. Coyle "Introduction of organic photochemistry" John Wiley & Sons Ltd.

2. Dwaine O. Cowan & Ronald L. Drisko "Elements of organic photochemistry" Plenum Press, New York and Londen.

3. William Kemp "Organic spectroscopy" Macmillan.