Syllabus for TO-B(2)

Fundamentals of Physical Chemistry:

- Thermodynamics: Chemical Thermodynamics, Molecular Thermodynamics.
- Quantum Chemistry
- Chemical Kinetics : Recapitulation, Theories of Reaction Rates

Molecular Symmetry and Chemistry of Main Group Elements:

- Definitions and Theorems of Group Theory
- Molecular Symmetry and Symmetry Groups
- Representations of Groups
- Group Theory and Quantum Mechanics
- Symmetry Adapted Linear Combinations
- Molecular Orbital Theory
- Periodicity in Properties
- S Block Elements
- P Block Elements
- Organometallic Compounds

Fundamentals of Organic Chemistry

- Structure and Reactivity
- Stereochemistry
- Substitution Reaction
- Aromatic Electrophilic Substitution
- Aromatic Nucleophilic Substitution
- Addition Reactions: Addition to C-C multiple bonds
- Elimination Reactions

Good Laboratory Practices and Biomolecules:

- Good Laboratory Practices
- Biomolecules

Advanced Physical Chemistry:

- Molecular spectroscopy
- Chemical bonding
- Nuclear and radiation Chemistry

Coordination and Bioinorganic Chemistry:

- Ligand Field Theory of Coordination Complexes
- Electronic spectra of Transition Metal Complexes

- Magnetic Properties of Coordination Complexes
- Biochemistry of Porplyrins, Iron, Maganense & other metals in medicine

Synthetic Organic Chemistry and Spectroscopy:

- Oxidation reactions
- Reduction reactions
- Rearrangements
- Photochemistry
- IR
- PMR
- Introduction to CMR and mass spectrometry
- Problems based on UV, IR and PMR

Modern Separation Methods and Chemometrics:

- Modern Separation Methods and Hyphenated Techniques:
  - Mass Spectrometry Principle
  - Gas Chromatography
  - High Performance Liquid Chromatography (HPLC)
- Chemometrics
- Data Handing and Spreadsheets in Analytical Chemistry
- Quality in Analytical Chemistry

Advance Analytical Techniques

- Electro-analytical technique
  - Coulometry
  - Polarography
  - Hydrodynamic voltametry
  - Pulse Polarography
  - Cyclic Voltammetry and Amperometry
- **Thermal Methods of Analysis**
  - Thermo gravimetric methods of analysis
  - Differential Thermal Analysis (DTA)
  - Differential Scanning Calorimetry (DSC)
  - Thermometric titrations and evolved gas analysis(EGA)
- **Atomic Spectroscopic Techniques**
  - Introduction to Optical Atomic Spectroscopic Analysis
  - Atomic Absorption Spectroscopy
  - Atomic Emission Spectrometry (AES)
  - Atomic Fluorescence Spectroscopy (AFS)
  - Atomic Mass Spectroscopy.

- Laser Based Techniques

Extraction Techniques and Metallurgy

- Liquid-Liquid extraction (LLE)
- Solid Phase Extraction (SPE)
- Microwave Assisted and Supercritical Fluid Extraction
- Analysis of Ores and Alloys
- Metallurgy
- Analysis of Soil

Structure Determination by Analytical Methods

- $_{1}$H-NMR Spectroscopy
- 13C NMR spectroscopy
- 2D NMR Techniques
- Mass Spectrometry

Chemistry of Natural Products and Chiron Approach

- Total Synthesis of some important Natural products
- Biogenesis: The building blocks and construction mechanism of
- Chiron Approach
- Chiral Drugs

Analytical Spectroscopy

- Electron Microscopy
  - Electron spectroscopy
  - Surface Characterization by spectroscopy and microscopy
  - X- ray Methods of Analysis
  - Chemiluminescence, Fluorescence and phosphorescence
  - Nuclear magnetic resonance spectroscopy:
    - $_{1}$H- NMR
    - $_{13}$C NMR
    - 2-D NMR
- Electron Paramagnetic Resonance Spectroscopy (EPR)

Advanced Synthetic Organic Chemistry:

- Transition metal complexes in organic synthesis