**523 Chem**

This course to study the fundamentals of some physicals methods to help students understand the techniques of this methods will be the most useful in solving structural problems.

**Tools and Concepts:**

**Introduction**

**Timescales**

**Diffraction Methods:**

Introduction

Diffraction of electrons, neutrons and X-ray

Diffraction by single crystals; symmetry

* The unit cell
* Symmetry elements within the unit cell
* The seven crystal systems
* Three-dimensional periodic symmetry; space groups
* Close packed structural-Cubic and hexagonal close packing

**Diffraction by single crystals; the theoretical basis**

**Diffraction by single crystals; the experiment**

* Crystal growth
* Experimental set-up
* Indexing and determining unit cell dimensions
* Data collection
* Experimental problems: X-ray absorption and extensions
* Data analysis

**Diffraction by single crystals; interpretation of results**

* How good is structure
* Common problems: incorrect atom assignment
* Common problems: disorder
* Recognizing chemical bonds
* Absolute structure determination
* How big can we go

**Diffraction by single crystals; electron density determination**

**Nuclear Magnetic Resonance Spectroscopy:**

* Introduction
* The nuclear magnetic resonance phenomenon
* Information from chemical shifts
* Information from NMR intensities
* Information from coupling constants
* Two –dimensional NMR
* Solids NMR

**Electron Paramagnetic Resonance Spectroscopy**

* Electron Paramagnetic Resonance experiment
* Hyperfine coupling in isotropic systems
* Anitropic systems
* Hyperfine splitting and g factors

**Mossbauer Spectroscopy**

* Introduction
* The Mossbauer effect
* The isomer shift
* Quadruple splitting
* Magnetic splitting
* Compound identification

**Electronic Characterization technique:**

* Introduction
* Electron energy levels in molecules
* Symmetry and molecular orbitals
* Photoelectron spectroscopy
* Valence excitation spectroscopy
* Electron energy levels and transitions in transition metal complexes.

**References:**

1. **Structural Methods in Molecular Inorganic Chemistry, Wiley (2013) D.Rankin, N.Mitzel, C.Morrison**
2. **Crystal Structure Determination, W.Clegg, Oxford (1998).**
3. **Structure and Bonding in Crystalline Materials , Greoge.Rohrer (1998).**
4. **Basic Solid State Chemistry , A.West, Wiley(1997)**
5. **NMR,NQR,ERP,Mossbauer Spectroscopy in Inorganic Chemistry, R.V.Parish(1990)**
6. **Solid State Chemistry, E.Lesley Smart and Eliane.Moore, Taylor (2005).**

**Dr.Norah Alhaqbani,**

[**nhokbany@ksu.edu.sa**](mailto:nhokbany@ksu.edu.sa)

**office No: 180 -3rd floor.**

**Midterm exam=30**

**Showcase=30**

**Final exam=40**