

## **CH422 Advanced Inorganic Electronic Spectroscopy**

**Credit Hours:** 3-0

**Pre-requisite:** NIL

### **Course Objectives:**

1. To describe and demonstrate diffraction, including interpretation of basic spectroscopic data. To introduce metals and electronic materials in the context of a molecular-level understanding of bonding. To introduce the relationship between energy levels and symmetry of compounds. Give the student an appreciation of recent developments in materials science & engineering within the framework of this class. Interpretation of spectroscopic analysis in terms of group theory to have a deep insight into electronic levels and plausible electronic excitations.

### **Detailed contents:**

2. The Electronic States of transition metal complexes; Term symbols, Russell Saunders coupling scheme; Derivation of term symbols for  $d^1$ - $d^{10}$  systems,  $d$ - $d$  transitions; Connecting atomic states and molecular states, correlation diagrams; Development of correlation and Tanabe-Sugano diagrams; Crystal field diagrams; Energy level calculations; selection rules, band intensities, and band assignments; Interpretation of crystal field and charge transfer spectra; Spectra of low symmetry complexes; Application of group theory to vibrational spectra of simple and coordination compounds.

### **Course Outcomes:**

3. At the end of class, students will be able to understand the basic concepts involved in spectroscopic analysis of advanced materials. They would be able to correlate electronic bands with the symmetry and 3D orientation of advanced materials especially those involved in photochemistry, analytical chemistry, organometallics, and Inorganic materials chemistry.

### **Recommended Books:**

1. Yarwood, J., Bazin, P., and Douthwaite, R., *Spectroscopic Properties of Inorganic and Organometallic Compounds*, Volume 42, The Royal Society of Chemistry, UK, (2011).
2. Lever, A. B. P., *Inorganic Electronic Spectroscopy*, 2nd ed., Elsevier, UK, (1984).
3. Brisdon, A. K., *Inorganic Spectroscopic Methods*, Oxford University Press,

- UK, (1998).
4. Iggo, J. A. *NMR Spectroscopy in Inorganic Chemistry*, Oxford University Press, UK, (1999).
  5. Solomon, E.I., *Inorganic Electronic Structure and Spectroscopy: Methodology*, Volume 2, Wiley, New York, (1999).
  6. Catherine E. Housecroft, Alan G. Sharpe, *Inorganic Chemistry*, 5<sup>th</sup>ed., Pearson, (2018).
  7. Miessler, G. L., Fischer P. J., Tarr, D. A., *Inorganic Chemistry*, 5<sup>th</sup> ed., Pearson, (2014).
  8. Weller, M., Overton, Tina., Rourke, J., and Armstrong, F., *Inorganic Chemistry*, 6<sup>th</sup>ed., Oxford University Press, (2014).
  9. Douglas, B., McDaniel, D., Alexander, J., *Concepts and Models of Inorganic Chemistry*, 3<sup>rd</sup> ed., John-Wiley & Sons, New York, (1994).
  10. Cotton, F.A. and Wilkinson, G., *Advanced Inorganic Chemistry*, 6th ed., John-Wiley & Sons, New York, (2007).
  11. Huheey, J. E., *Inorganic Chemistry: Principles of Structure and Reactivity*, 3<sup>rd</sup> ed., Harper International SI Edition, (2006).
  12. House, J.E., *Inorganic Chemistry*, Academic Press. USA, (2008).