

## **CH3208: Organometallics and Bio-inorganic chemistry (4 credits: 3-1-0)**

**Structure and Bonding:** Introduction, 18 electron rule, application to  $\pi$ - acceptor ligands, limitations. 16 electron rule, examples. Synthesis and reactivity of metal carbonyls, vibrational spectra of metal carbonyls. Metal- metal bonds and metal atom clusters. Types of M-C bonds; synthesis and reactivity of metal alkyls, carbenes, alkenes, alkynes, and arene complexes. Metallocenes and bent metallocenes. Structure and bonding in Zeise's salt, bis-(triphenylphosphine) diphenylacetylene platinum (0), diallyl nickel, ferrocene and dibenzene chromium(0). Isolobal analogy. Bonding and important reactions of metal nitril, dinitrogen and dioxygen complexes, tertiary phosphine and NHC complexes.

**Reactions of Organometallics:** Substitution, oxidative addition, reductive elimination, insertion and deinsertion. Catalysis - Hydrogenation, Hydroformylation, Monsanto process, Wacker process, Alkene polymerization (Zeigler-Natta Catalyst), Reppe catalyst.

**Boranes and phosphazenes.**

**Bio-inorganic Chemistry:** Oxygen transport; Hemoglobin, myoglobin, hemerythrin, hemocyanin. Vitamin B12 and coenzymes. Electron- transfer reactions; nitrogen fixation, metal complexes in medicine. Photosystems and porphyrins.

**Text Books/References:**

1. James E. Huheey, Inorganic Chemistry - Principles of Structure and Reactivity, 4th Edition, Pearson Education, 2006.
2. R. H. Crabtree, The organometallic chemistry of the transition metals, 4<sup>th</sup> ed, Wiley, 2005.
3. Stephen J. Lippard and Jeremy M. Berg, Principles of Bioinorganic Chemistry, 2nd Edition, Panima Publishing Corporation, 2005.