

## 2<sup>nd</sup> semester

MCYC201 Inorganic Chemistry-II

(3-1-0) 4 credits

### Module-I

#### **Magnetic properties of coordination compounds**

Types of magnetic behaviour, magnetic susceptibility and its determination by Gouy, Faraday and VSM method, Pascal's constants and constitutive corrections, paramagnetism, Curie-Weiss law, Van Vleck's equation (derivation excluded) and its applications, spin-orbit coupling, ferro- and anti-ferromagnetism coupling, super paramagnetism, high and low spin equilibria.

Anomalous magnetic moments, magnetic exchange coupling and spin crossover.

Magnetic properties of Lanthanide and Actinide metal complexes.

### Module-II

#### **Organometallic chemistry-I**

Stability and 18 electron rules (covalent and ionic),

Alkyls/aryl and hydrides: alkyls and aryls (metal alkyls stabilized carbanion,  $\beta$ -elimination, stable alkyls, agostic alkyls, reductive elimination, preparation of metal allyls).

Metal hydrides: synthesis, characterization, reactions, bridging hydrides.

Pi-complexes: Synthesis, bonding, properties and applications of alkenes and alkynes, allyls, diene, cyclopentane, dienyl, arenes.

Introductory idea on transition metal-carbon multiple compounds: carbene and carbyne.

### Module-III

#### **Organometallic chemistry-II**

Reactivity of organo-transition metal complexes: Coordinative unsaturation, substitution reactions (nucleophilic and electrophilic addition and abstraction), oxidative addition and reductive elimination, insertion reactions (insertion of CO, SO<sub>2</sub> and alkenes).

Catalysis by organo-transition metal complexes: Alkene isomerisation, hydrogenation and hydroformylation; Zeigler-Natta polymerization of ethylene, reduction of carbon monoxide by hydrogen (Fischer-Tropsch reaction).

#### **Fluxional Organometallic Compounds**

Fluxionality and dynamic equilibria in compounds such as  $\eta^2$ -olefin,  $\eta^3$ -allyl and dienyl complexes.

#### **Selected Text/Reference Books:**

1. The Organometallic Chemistry of the Transition Metals, Robert H. Crabtree, Wiley, 2014.
2. Organotransition Metal Chemistry: From Bonding to Catalysis, John F. Hartwig, University Science Books, 2009.
3. Organotransition Metal Chemistry, Anthony F. Hill, Royal Society of Chemistry,
4. Tutorial Chemistry Text, 2002. Chapters 1 to 7.
5. Organometallics: A concise Introduction, Ch. Elshebroich and A Salzer, VCH, 2006.
6. Organotransition Metal Chemistry: Applications to Organic Synthesis, S.G.Davies, Pergamon 1982.
7. A.K. Das and M. Das, *Fundamental Concept of Inorganic Chemistry*, Vol. 4 and 5, CBS Publisher & Distributor Pvt. Ltd., New Delhi, 2014.
8. *Organometallic Chemistry*, R.C. Mehrotra and A. Singh, New Age International Publishers, 2<sup>nd</sup> Edn, 2000.
9. Elements of Magnetochemistry, R.L. Dutta and A. Samal, S. Chand & Company Ltd., 1982.