Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NCYD503	Cluster Chemistry	3	0	0	3

Course Objective
• The course is intended to provide students the chemistry behind formation of various types of cluster compounds, develop understanding about the bonding involved and predict their structures. It also intended to introduce the role of cluster compound as catalysts.
Learning Outcomes
• At the end of the course students should be able to- • Construct the valence bond scheme of boron clusters • Predict the structure of the clusters • Rationalise structure of clusters

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Clusters: Definition, Clusters of Main Group elements, Clusters of Alkali and Alkaline earth metals, Preparation, structure and bonding, Reactivity of clusters.	10L	Able to identify clusters Develop understanding about its preparation, bonding and reactivity
2	Higher Boranes: Preparation structure, bonding and reactivity of Higher Boranes and carboranes, Naming of Boranes and carboranes, styx numbers, Wade's rules. Clusters of early and late main group elements. Role of ligands in cluster formation, design methodology.	15L	Develop understanding about the methods of preparation, structure, bonding and reactivity of high nuclearity borane clusters Develop understanding on the design aspect of clusters of early and later main group elements
3	Transition Metal carbonyl clusters, early and late transition metal clusters, Mingo's Rules, Jemmi's '*mno'* rule. Metal-metal multiple bonded systems, structure, bonding and reactivity, Isopoly &h eteropoly acids & salts, PSEP Theory, violations, capping principle, Metal carbonyl hydride clusters, Electron precise molecules, Catalysis by clusters	17L	Learns various rules on bonding in transition metal clusters. Learns theory of bonding in metal carbonyl hydride clusters. Develop understanding about the structure and bonding in metal-metal multiple bonded clusters and their reactivity. Learns structure, bonding and reactivity of iso and heteropoly acids/salts
Total		**42**	

Text Books:

1. Basic Organometallic Chemistry: Concepts, Syntheses and Applications, B.D. Gupta, Anil J. Elias, 2nd Edition, University Press, 2013.
2. Concepts and Models of Inorganic Chemistry, Bodie E. Douglas, Darl H. McDaniel and John J. Alexander, 3rd Edition, John Wiley and Sons, 1994.

Reference Books:

1. Inorganic and Organometallic Polymers, V. Chandrasekhar, Springer India, 2005.