Approval: 8th Senate Meeting

Course Name: Chemistry of Main Group Elements

Course Number: CY507

Credits: 3-1-0-4

Prerequisites: B.Sc. (with Chemistry) or Teachers consent

Intended for: UG/PG

Distribution: Core

Semester: Odd/Even

Course Preamble: The main focus of this course is to provide the students with deeper understanding of the properties of main group elements and their compounds. In addition, this course also aims at strengthening the knowledge of students in fundamental concepts related to Inorganic Chemistry such as chemical periodicity, structure and bonding of molecules, acidity, basicity etc.

Course Outline:

1. **[5 Lectures]**

   Chemical periodicity and periodic anomalies.

2. **[10 Lectures]**

   Structure and bonding in homo- and heteronuclear molecules, shapes of small molecules.

3. **[10 Lectures]**

   Concepts of acids and bases: Bronsted and Lewis acids and bases - Gas phase versus solution acidity - leveling effects of solvents - hardness and softness - surface acidity.

4. **[10 Lectures]**

   Pre-transition (alkali and alkaline earth) metals, their solutions in liquid ammonia. Noble gas compounds, structure and reactivity. Hydrogen and its compounds, H-bond and its influence on the structure and properties of crystals.

5. **[20 Lectures]**

   Chemistry of main group elements and their compounds: Borides, borates, boron halides, boranes, carboranes and metallocarboranes. BN compounds - a brief survey of Al, Ga and In chemistry. Allotropes of carbon - intercalation compounds – carbides - C-oxides - pure silicon - silica and silicates - silicones – low coordinated silicon compounds – a brief survey of Ge, Sn chemistry. P(III) and P(V) compounds, P-N, P-O and P-S compounds including cyclophosphazenes – a brief survey of heavier elements - nitrogen and phosphorus ligands - Sulfur-nitrogen compounds. Charge-transfer

complexes of halogens – Inter-halogen compounds - halogen oxides and oxygen fluorides - pseudohalogens.

Text and Reference Books:

1. F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann*, Advanced Inorganic Chemistry*, Wiley, 6th edition, 2007.
2. J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry*: Principles of Structure and Reactivity, 4th edition, Pearson Education Inc., 2000.
3. B. Douglas, D. McDaniel and J. Alexander, *Concepts and Models of Inorganic Chemistry*, 3rd edition, Wiley, 2006.
4. K. F. Purcell and J. C. Kotz, *Inorganic Chemistry*, Cengage Learning, 2010.
5. A. G. Sharpe, *Inorganic Chemistry*, 3rd edition, Pearson, 2011.
6. P. Atkins et al, *Shriver & Atkins' Inorganic Chemistry*, 5th edition, W. H. Freeman and Company, New York, 2010.