Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NCYC103	**General Chemistry -II**	3	0	0	3

Course Objective
To familiarize students with different aspects of practical chemistry in laboratory
Learning Outcomes
Students will learn various perspectives of undergraduate chemistry.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Kinetic Theory and Gaseous state:** Concept of pressure and temperature from kinetic theory of gas. Nature of distribution of velocities, Maxwell's distribution of speeds in one, two and three dimensions; Kinetic energy distribution in one, two and three dimensions, calculations of average, root mean square and most probable values in each case; Collision of gas molecules; Collision diameter; Collision number and mean free path; Frequency of binary collisions (similar and different molecules); Wall collision and rate of effusion Calculation of number of molecules having energy $\geq \varepsilon$, Principle of equipartition of energy and its application to calculate the classical limit of molar heat capacity of gases.	7	Students will learn gas pressure and behavior using the concept of rapidly moving particles, relate temperature. Basic understanding of average kinetic energy, apply the ideal gas law to calculate gas properties, and the distribution of molecular speeds, differentiate between real and ideal gases.
2	**Real gas and Virial equation:** Deviation of gases from ideal behaviour; Compressibility factor; Boyle temperature; Andrew's and Amagat's plots; van der Waals equation and its features; its derivation and application in explaining real gas behaviour; Existence of critical state, Critical constants in terms of van der Waals constants; Law of corresponding states; Virial equation of state; van der Waals equation expressed in the Virial form and significance of second virial coefficient; Intermolecular forces (Debye, Keesom and London interactions; Lennard-Jones potential - elementary idea.	7	It introduces the virial equation as a way to model real gases over a wider range of pressures and temperatures compared to the ideal gas law.
3	**Chemical Bonding**: Introduction to chemical bonding, the octet rule, Lewis dot structure, formal charge, limitation of the octet rule, Concept of covalent and ionic bonding, bond parameters: bond length, bond order, bond angle, resonance structures, dipole moment The Valence Shell Electron Pair Repulsion (VSPER) theory, application in predicting the shape of molecules, limitations Valence Bond Theory (VBT): orbital overlap concept, hybridization, limitations of VBT	14	Students will get basic knowledge of the structure and bonding of inorganic molecules.
6	**Chirality arising out of stereo axis**: stereoisomerism of substituted cumulenes; chiral axis in allenes, spiro compounds, alkylidenecycloalkanes and biphenyls; related configurational descriptors; atropisomerism; racemisation of chiral biphenyls. **Concept of prostereoisomerism**: prostereogenic centre; concept of (*pro*)n-*chirality*: topicity of ligands and faces (elementary idea).	6	In this part, students will learn the basic concept of chirality and its descriptors. Several examples will be discussed to understand chirality in different types of organic molecules. Next, students will learn about the origin of chirality in different types of organic molecules.
7	**Conformation***:* conformational nomenclature: eclipsed, staggered, *gauche*, *syn* and *anti*; dihedral angle, torsion angle; Klyne-Prelog terminology; energy barrier of rotation, concept of torsional and steric strains; relative stability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; *butane gauche* interaction; conformational analysis of ethane, propane, *n*-butane, 2-	8	In this part, students will first learn the difference between configuration and conformation. Then they will learn about the conformation of simple organic molecules and their descriptors.

	methylbutane and 2,3-dimethylbutane; haloalkane, 1,2-dihaloalkanes and 1,2-diols (up to four carbons); 1,2-halohydrin; conformation of conjugated systems.		

Text Book:

1. **Castellan, G. W. Physical Chemistry, Narosa, 2004.**
2. **Greenwood, N.N. & Earnshaw A. Chemistry of the Elements, ButterworthHeinemann, 1997. 3.**
3. **Huheey, J. E.; Keiter, E.A. & Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed., Harper Collins 1993, Pearson,2006**
4. **Fundamental Concepts of Inorganic Chemistry, Vol 2, Asim K Das, CBS Publishers & Distributors Pvt. Ltd. 2nd ebook edition 2019.**

Reference Books:

3. **Shriver Atkin's Inorganic Chemistry by P. Atkins, T. Overton, J. Rourke, M. Weller, M. Armstrong, 5th Edn, Oxford University Press, 2009.**
4. **Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, 11th Edition, Oxford University Press, 2018.**
5. **Cotton, F.A., Wilkinson, G., Murrillo, C. A., Bochmann, M., Advanced Inorganic Chemistry 6th Ed. 1999., Wiley**