

B.Sc. I SEMESTER			
Part-A: Introduction			
Program: Certificate Course		Session-2023-24	
1.	Course Code	CHSC-1T	
2.	Course Title	Basic Chemistry- 1	
3.	Course Type	Discipline Specific Course (DSC)	
4.	Pre-requisite (if any)	To study this course our students must have had the subject chemistry in class +2 equivalent	
5.	Course Learning Outcome(CLO)	At the end of this course, the students will be able to learn the following aspects of chemistry	
		<ul style="list-style-type: none"> To learn basic concept of atomic structure and the periodic properties of elements 	
		<ul style="list-style-type: none"> To understand chemical bonding in ionic and covalent compounds 	
		<ul style="list-style-type: none"> Understand Basic concept of mathematics for chemists, the kinetic model of gases and its properties, Behaviour of real gases, its deviation from ideal behaviour, equation of state, isotherm and law of corresponding states and molecular velocities 	
		<ul style="list-style-type: none"> Fundamental concept of liquid state and solid state 	
		<ul style="list-style-type: none"> Fundamental concept of bonding in organic chemistry & types of reaction 	
		<ul style="list-style-type: none"> Concept of saturated and unsaturated hydrocarbons 	
6.	Credit Value	3	
7.	Total Marks	Max. Marks:	100(80+20)

Part-B: Content of Course		
Total No. Of Lectures:		
Unit	Topic	No. Of Hours
I	<p>INORGANIC CHEMISTRY</p> <p>A. Atomic Structure - Idea of de Broglie matter waves, Heisenberg's uncertainty principle, atomic orbital's, shapes of <i>s</i>, <i>p</i> <i>d</i> orbital. Aufbau and Pauli's exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charges</p> <p>B. Periodic Properties of elements with special reference to Atomic radii, Ionic radii, Ionization Potential, Electron Affinity, Electronegativity trends in periodic table and application in predicting and explaining the chemical behavior</p> <p>C: Chemical Bonding- Covalent Bond-Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory and its application to NH₃, H₃O⁺, SF₄, ClF₃, ICl₂⁻ and H₂O. M.O. theory, homonuclear (H₂, N₂, O₂, F₂, Cl₂) and hetero nuclear (CO and NO), bond strength and bond energy, percentage ionic character from dipole moment and electro negativity difference</p>	12

	(D) Ionic Solids – Ionic structures, radius ratio and co-ordination number, limitation of radius ratio rule, lattice defects, Semiconductors, lattice energy and Born- Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions. Fajan's rule. Metallic bond-free electron, valence bond and band theories.	
II	<p>PHYSICAL CHEMISTRY</p> <p>Mathematical concepts for chemists:</p> <p>A. Logarithmic relations, curve sketching, linear graphs and Properties of straight lines, Slopes and intercept, differentiation of functions, partial differentiation Integration of some useful and relevant functions; maxima and minima, permutations and combinations, probability</p> <p>B. GASEOUS STATE CHEMISTRY</p> <p>Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path; Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, Joule Thompson effect, Liquefaction of Gases.</p> <p>Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor (Z), and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding State</p>	11
III	<p>PHYSICAL CHEMISTRY</p> <p>Liquid State-</p> <p>A. Intermolecular forces, magnitude of intermolecular force, structure of liquids, properties of liquids, viscosity and surface tension.</p> <p>B. Ideal and non ideal solutions mode of representing concentration of solution, activity and activity coefficient. Dilute solution: colligative properties, lowering of vapour pressure of solvent, Raoult law, osmosis, Vant Hoff Theory of dilute solution, measurements of osmotic pressure, relationship between lowering of vapour pressure and osmotic pressure, elevation of boiling point, depression in freezing point, abnormal molar masses, dissociation and association of solutes, Vant Hoff factor.</p> <p>C: Liquid Crystal-</p> <p>Difference between liquid crystal, solid and liquids. Classification, structure of nematic and cholesteric phases Thermography and seven segment cell, application of liquid crystal.</p> <p>D. Solid State - space lattices, unit cells, elements of symmetry in crystallized solids, X-ray diffraction, Bragg's equation, Miller indices, identification of unit cell by Bragg's spectrometer, powder method, Neutron and electron diffraction (Elementary idea only)</p>	11
IV	<p>ORGANIC CHEMISTRY</p> <p>A. Bonding in Organic compounds- covalent bond, orbital theory, sigma and pi bond, hybridization. Resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding, Dipole Moment</p> <p>B. Types of organic reaction Homolytic and heterolytic bond breaking. Types of reagents- electrophiles and nucleophiles structure and reactivity of Reaction</p>	11

	<p>intermediates-carbocations , carbanions, free radicals, carbenes, arynes and nitrenes.</p> <p>C. Alkanes- nomenclature, methods of formation, chemical reaction. Wurtz reaction, Kolbe reaction, Corey-House reaction , Free radical Halogenation,</p> <p>D. Alkenes- Nomenclature, Methods of preparation Chemical reactions of alkenes- mechanisms involved in electrophilic and free radical additions, Markownikoff's rule, Peroxide effect, hydroboration- oxidation, oximercuration-reduction, epoxidation Substitution at the allylic and vinylic position of alkenes, Structure of allenes and butadiene, Chemical reactions-1,2 and 1,4 additions, Diels-Alder reaction. Allylic bromination and mechanism e.g.-Propene, 1-butene,</p> <p>E. Alkynes-Methods of preparation and Chemical reaction of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reaction, hydroboration-oxidation with ozone and KMnO₄</p>	
<p style="text-align: center;">PART -C LEARNING RESOURCES</p>		
	<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Basic inorganic chemistry; F.A. Cotton, G. Wilkinson and P. I. Gaus, J.wiley. 2. Concise inorganic chemistry; J. D. Lee, ELBS. . 3. Advanced Inorganic Chemistry; Satya Prakash. 4. Advanced Inorganic Chemistry ;Puri & Sharma , S. Naginchand. 5. Inorganic Chemistry ; Madan, S.Chand. 6. Selected Topics in Inorganic Chemistry ; Madan Malik &Tuli ,S. Chand 7. Organic Chemistry ; Morrison and Boyd, Prentice Hall. 8. Organic Chemistry ; F.A. Carey McGraw Hill. 9. Organic Chemistry ;P.L.Soni 10. Organic Chemistry; Bahal& Bahal. 11. Organic Chemistry: I.L.Finar Vol.I&II 12. The Elements of Physical Chemistry; P. W. Atkins, Oxford 13. Physical Chemistry B.D. Khosla. 14. Physical Chemistry ; Puri &Sharma. 15. Bhautik Rasayan ; P. L. Soni. 16. Bhautik Rasayan; Bahal & Tuli. <p>E-learning Resources:</p> <p>Fundamental Chemistry related topics on SWAYAM platform and E-pathshala</p>	

	Part - D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods :			
Maximum Marks :		100 Marks	
Continuous Comprehensive Evaluation(CCE) :		20 Marks	
Semester End Examination(SEE) :		80 Marks	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Two Internal Test of 10 Marks each Assignment/Seminar –01 of 10 Marks		Total of maximum obtained marks in test exam and Assignment
Semester End Exam (SEE):	Paper – Two section – A & B Section A: Objective & Short answer type questions – 1 x10 + 3 x 10 = 40 Marks Section B: Descriptive answer type questions unit wise – 10 x 04 = 40 Total Marks-80		

Chairman and Members of B.O.S.-