Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of MSc)				
1	Stoichiometry, Solutions and Gases	CY101	3-1-2	5	100
2	Atomic Structure and Chemical Bonding	CY103	3-0-2	4	85
3	Qualitative and Quantitative Analysis	CY105	3-0-2	4	85
4	Mathematics for Chemistry	MA121	3-1-0	4	70
5	Physics of Materials and Nuclei	PH111	3-0-0	3	55
6	Indian Value System and Social Consciousness	HS120	2-0-0	2	35
			Total	**22**	**430**
7	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CYV01 / CYP01	0-0-10	5	200 (20 x 10)
	Second Semester (1st year of MSc)				
1	Fundamentals of Organic Chemistry	CY102	3-1-2	5	100
2	Basic Industrial Chemistry	CY104	3-0-2	4	85
3	Chemistry of s- and p-block Elements	CY106	3-0-0	3	55
4	Fundamentals of Computer and Programming	CS110	3-0-2	4	85
5	English and Professional Communication	HS110	3-1-0	4	70
			Total	**20**	**395**
6	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CYV02 / CYP02	0-0-10	5	200 (20 x 10)
	Third Semester (2nd year of MSc)				
1	Chemistry of d- and f-block Elements	CY201	3-1-2	5	100
2	Hetero Functional Groups and Heterocycles	CY203	3-0-2	4	85
3	State and Properties of Matter	CY205	3-0-2	4	85
4	Optics	PH205	3-0-2	4	85
5	Quality Control and Quality Assurance	CY207	3-0-0	3	55
			Total	**20**	**410**
6	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	CYV03 / CYP03	0-0-10	5	200 (20 x 10)
	Fourth Semester (2nd year of MSc)				
1	Coordination and Bioinorganic Chemistry	CY202	3-0-2	4	85
2	Organic Reaction Mechanism	CY204	3-1-2	5	100
3	Equilibrium and Changes	CY206	3-0-2	4	85
4	Dyes and Drugs	CY208	3-0-2	4	85
5	Biomolecules and Cell Biology	CY212	3-0-0	3	55
			Total	**20**	**410**
6	Laboratory Demonstration of Quality Control and Quality Assurance Practical Vocational Training / Professional Experience (Optional) (mandatory for exit)	CYV04 / CYP04	0-0-10	5	200 (20 x 10)

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	Fifth Semester (3rd year of MSc)				
1	Organometallic Chemistry	CY301	3-0-2	4	85
2	Pericyclic Reactions and Photochemistry	CY303	3-0-4	5	115
3	Analytical Chemistry	CY305	3-0-4	5	115
4	Physical Methods of Structure Determination	CY307	3-0-0	3	55
5	Unit Process in Chemical Industries	CY309	3-0-0	3	55
			Total	**20**	**425**
6	Purification of Liquids and Solids Vocational Training / Professional Experience (Optional) (mandatory for exit)	CYV05 / CYP05	0-0-10	5	200 (20 x 10)
	Sixth Semester (3rd year of MSc)				
1	Interpretative Molecular Spectroscopy	CY302	3-1-0	4	70
2	Molecules in Motion and Reaction Dynamics	CY304	3-1-2	5	100
3	Polymer Chemistry	CY306	3-0-4	5	115
4	Chemistry in Industries	CY308	3-0-0	3	55
5	Materials Chemistry	CY312	3-0-0	3	55
			Total	**20**	**395**
6	Vocational Training / Professional Experience (Optional) (mandatory for exit)	CYV06 / CYP06	0-0-10	5	200 (20 x 10)
	Seventh Semester (4th year of MSc)				
1	Reaction Mechanism in Coordination Chemistry	CY401	3-0-4	5	115
2	Synthetic Approaches in Organic Chemistry	CY403	3-0-4	5	115
3	Atomic Spectroscopy and Electron Microscopic Techniques	CY405	3-1-0	4	70
4	Computational Chemistry	CY407	3-0-4	5	115
5	Elective	CY4AA	3-X-X	3/4	55/70/85
			Total	**22-23**	**470-500**
6	Skill Development on Computational Tools Vocational Training / Professional Experience (Optional) (mandatory for exit)	CYV07 / CYP07	0-0-10	5	200 (20 x 10)
	Eighth Semester (4th year of MSc)				
1	Symmetry, Spectra and Magnetism	CY402	3-1-0	4	70
2	Chemistry of Natural Products	CY404	3-0-4	5	115
3	Physical Aspects of Molecular Spectroscopy	CY406	3-1-0	4	70
4	Purification and Separation Techniques	CY408	3-0-4	5	115
5	Elective	CY4BB	3-X-X	3/4	55/70/85
			Total	**21-22**	**425-455**
6	Skill Development on GMP and GLP Vocational Training / Professional Experience (Optional) (mandatory for exit)	CYV08 / CYP08	0-0-10	5	200 (20 x 10)
	Ninth Semester (5th year of MSc)				
1	Quantum Chemistry	CY501	3-0-0	3	55
2	Heterocycles and Organic Synthesis	CY503	3-0-0	3	55

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3	Research Methodology in Chemistry	CY505	3-0-0	3	55
4	Elective	CY5AA	3-X-X	3/4	55/70/85
5	Elective	CY5BB	3-X-X	3/4	55/70/85
6	Research Training in Chemical Sciences	CYP09	0-0-10	5	200 (20 x 10)
			Total	**20-22**	**475-535**
	Tenth Semester (5th year of MSc)				
1	M.Sc. Dissertation Industrial Internship / Professional Experience (Mandatory)	CYP10	0-0-40	20	800 (40 X 20)
			Total	**20**	**800**

Sr. No.	**Elective**	**Code**	**Scheme L-T-P**
1	Surfactant Chemistry	CY451	3-0-0
2	Chemistry of Nanomaterials	CY452	3-0-0
3	Green Chemical Processing	CY453	3-0-0
4	C-H Functionalization	CY454	3-0-0
5	Catalysis	CY551	3-0-0
6	Medicinal Chemistry	CY552	3-0-0
7	Supramolecular Chemistry	CY553	3-0-0
8	Nuclear Chemistry	CY554	3-0-0

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Department of Chemistry
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M.Sc.– I (Chem), Semester – I STOICHIOMETRY, SOLUTIONS AND GASES CY101	Scheme	L	T	P	Credit
		3	1	2	05

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Acquire the knowledge of stoichiometric in chemical reactions.
CO2	Memorize the basic theoretical knowledge of solutions and gases.
CO3	Learn the fundamentals of solutions and gases along with their thermodynamics.
CO4	Perform the experiments related to preparation of various solutions of different concentrations and estimation of concentrations using titrations.
CO5	Develop expertise in handling of laboratory solutions and glasswares.

2.	Syllabus	
	CHEMICAL REACTIONS & STOICHOMETRY	**(10 Hours)**
	Chemical reaction and chemical equation, balanced chemical equations, law of conservation of mass, law of constant composition/definite proportion, law of multiple proportions, Law of reciprocal proportions, Gay-Lussac's law of gaseous volumes, stoichiometry and its significance, mole ratio method, chemical equivalence - metathesis and redox, chemical formula from percentage composition, molecular formula from empirical formula, limiting reagent, reaction yield, stoichiometry and titrations. Numerical problems.	
	SOLUTIONS	**(10 Hours)**
	Solution composition, ways of expressing concentration, molarity, molality, normality, mole fraction, solutions of gases in gases, Henry's law, solutions of liquids in liquids, solubility of completely miscible liquids, solubility of partially miscible liquids, phenol-water system, nicotine-water system, vapour pressures of liquid-liquid mixtures, azeotropes, theory of fractional distillation, steam distillation, solutions of solids in liquids, solubility-equilibrium concept, determination of solubility, solubility of solids in solids.	
	GASES	**(10 Hours)**
	States of a gas, equation of state, perfect gas law, kinetic model of gases, mixture of gases, partial pressures, Dalton's law, real gases, molecular interactions in gases, compression factor, virial equation of state, Boyle's temperature, critical states, critical constants, liquefication of gases, van der Waal's equation and limitations, interpretation of deviations from van der Waal's equation, law of the corresponding states. The kinetic model of gases, Maxwell distribution of speeds, collisions with walls and surfaces, rate of effusion, transport properties of a perfect gas.	
	THERMODYNAMICS OF GASES	**(09 Hours)**

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	First law of thermodynamics and gases – internal energy, enthalpy, work function, heat changes, second law of thermodynamics and gases, Helmholtz and Gibb's energies, Maxwell's relations, criteria of reversibility, van't Hoff isotherm, van't Hoff isochore, carnot cycle, entropy, entropy changes, Nernst heat theorem, third law of thermodynamics and imperfections	
	KINETICS AND THERMODYNAMICS OF SOLUTIONS	**(06 Hours)**
	Molecular motion in liquids, methods to detect motion in liquids, electrolyte solutions, Arrhenius theory and Ghosh theory of electrolytes, activity and activity coefficient, conductivity, specific conductivity, equivalent conductivity, molar conductivity, Kohlrausch's law, mobilities of ions, Grotthuss mechanism.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours + 30 Hours = 90 Hours)	

3.	**Tutorials**
1	Numericals based on application of stoichiometry to chemical reactions.
2	Calculations based on limiting reagents, reaction yields and titrations.
3	Determination and conversion of concentration terms.
4	Diagrams and calculations based on partially immiscible liquids.
5	Calculations based on solubility –equilibrium concept.
6	Numericals based on compressibility factor and virial equation of state.
7	Graphs and calculations based on liquefaction of gases, critical states and critical values.
8	Solving problems related to Maxwell distribution of speeds.
9	Calculation based on internal energy, enthalpy, work function and free energy changes during gaseous reactions.
10	Applications of Maxwell's relation in thermodynamics.
11	Entropy changes in gases.
12	Conductivities of solutions.
13	Effect of dilution and temperature on conductivities.
14	Ionic mobility and abnormally high ionic conductances.

4.	**Practical**
1	Preparation of primary and secondary standards along with the standardization of secondary solutions.
2	Estimation of a weak acid, CH3COOH with a standardized NaOH solution.
3	Determination of Na2CO3 and NaOH in a mixture with standardized HCl solution.
4	Estimation of boric acid with standardized NaOH solution.

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5	Estimation of CH3COOH and HCl in a mixture by titrating with a strong base, NaOH.
6	Preparation of KMnO4 and estimation of H2O2 using standardized KMnO4 .
7	Estimation of iodine concentration using standardized sodium thiosulphate.
8	To study the kinetics of ester hydrolysis in acidic media.
9	Demonstration: To find out the dissociation constant of acetic acid by potentiometric titration.
10	Demonstration: To titrate 'X'N H2SO4 by titrating it against 0.1N NaOH solution potentiometrically and find out the endpoint, normality and strength of H2SO4 solution.

5.	**Books Recommended**
1	B. R. Puri, L. R. Sharma, M.S. Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publications, New Delhi, 2017.
2	G. Raj, Advanced Physical Chemistry, 4th edition, Goel Publishing House, Meerut, 1990.
3	P. Atkins, J. de Paula, J. Keeler Atkins' Physical Chemistry, 11th edition, Oxford Publishing House, 2018.
4	A. Bhal, B. S. Bahl, G. D. Tuli, Essential of Physical Chemistry, 28th edition, S.C. Chand, 2020.
5	A. K. Nad, B. Mahapatra, A. Ghoshal, An Advanced Course in Practical Chemistry, New Central Book Agency P Ltd, 2022.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – I ATOMIC STRUCTURE AND CHEMICAL BONDING CY103	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Gain knowledge of basic chemistry of elements.
CO2	Apply the concept of lattice energy using Born-Landé equation.
CO3	Understand the importance and application of chemical bonds, inter-molecular and intramolecular weak chemical forces.
CO4	Solve the conceptual questions using the knowledge gained by studying the quantum mechanical model.
CO5	Describe the plausible structures and geometries of molecules using Radius Ratio Rules, VSEPR theory and MO diagrams.

2.	Syllabus	
	PERIODIC TABLE AND ATOMIC PROPERTIES	**(13 Hours)**
	Periodicity of Elements: Brief discussion of the properties of the elements: Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in the periodic table, Atomic and ionic radii, Ionization enthalpy, Successive ionization enthalpies, and factors affecting ionization enthalpy and trends in groups and periods, Electron gain enthalpy and trends in groups and periods, Electronegativity, Pauling's/ Allred Rochow's scales. Variation of electronegativity with bond order, partial charge, hybridization, and group electronegativity.	
	CHEMICAL BONDING AND MOLECULAR STRUCTURE	**(16 Hours)**
	Atomic models, de Broglie principle, postulates of quantum mechanics, quantum numbers Schrödinger wave equation: The significance of Ψ^2 , Schrodinger wave equation for H-atom, angular and radial wave function, Valence Band Theory, Valence Shell Electron Pair Repulsion theory, hybridization, geometry and shape of molecules, Molecular Orbital Theory, molecular orbital diagrams of diatomic and simple polyatomic molecules: N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbital interaction to be given).	
	IONIC SOLIDS	**(16 Hours)**
	Ionic structure, radius ratio effect, and coordination number, calculation of limiting radius ratio values for Coordination numbers, limitations of radius ratio rule, lattice defects, semi-conductors, lattice energy, 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; weak interactions: hydrogen bonding, Van der Waals interactions. covalent bond, coordinate bond, hydrogen bond, dipole moment. Metallic Bond: The qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in	

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	solids, effects of weak chemical forces, melting and boiling points, solubility, and energetics of the dissolution process	
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Estimation of Cu(II) ions iodometrically using $Na_2S_2O_3$.
2	Estimation of oxalic acid using $KMnO_4$ by redox titration.
3	Estimation of oxalic acid and sodium oxalate in a mixture.
4	Estimation of Fe(II) with $K_2Cr_2O_7$ using an internal indicator (diphenylamine, N-phenylanthranilic acid) and discussion of the external indicator.
5	Estimation of Fe(II) using standardized $KMnO_4$ solution.
6	Determination of strength of potassium dichromate solution iodometrically using sodium thiosulphate.
7	Preparation of ammonium Cu(II) sulphate tetrahydrate complex.
8	Preparation of ferrous ammonium sulphate.
9	Preparation of potassium trioxalatochromate(III).
10	Preparation of sodium ferrioxalate(sodium trioxalatoferrate(III).

4.	**Books Recommended**
1	Lee, J. D. (1998). Concise Inorganic Chemistry (5th ed.). United Kingdom: Recommended Books have been reviewed 12 Wiley/Oxford Publications.
2	Puri, B.R., Sharma, L.R. &. Kalia, K.C. (2017). Principles of Inorganic Chemistry (33rd ed.). India: Vishal Publications.
3	Cotton, F. A., & Wilkinson, G. (1994). Basic Inorganic Chemistry (3rd ed.). United Kingdom: John Wiley Publications.
4	Bhagchandani, P. (2017). Inorganic Chemistry. India: Sahitya Bhawan Publications. 5. Malik, W. U., Tuli, G.D., & Madan, R. D.(2010).
5	Atkins, P.; Paula, J. D., Atkin's Physical Chemistry, Oxford (Indian Edition), Oxford University Press, 2012.

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M.Sc.– I (Chem), Semester – I QUALITATIVE AND QUANTITATIVE ANALYSIS CY105	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Acquaint with the purpose and applicability of Basic Analytical Chemistry Tools
CO2	Adapt various mathematical tools in chemistry to gain knowledge about fundamental qualitative approaches.
CO3	Adapt reactions within the solution using fundamental theoretical principles.
CO4	Understand the use of gravimetric and titrimetric methods in analysing various methods.
CO5	Understand the applicability of Quality control and Quality assurance relevant to pharmaceutical, environmental and petrochemical industry.

2.	Syllabus	
	BASIC TOOLS OF ANALYTICAL CHEMISTRY	**(15 Hours)**
	Fundamental Units of Measure, Significant Figures, Units for Expressing Concentration, Stoichiometric Calculations, Accuracy, Precision, Sensitivity, Selectivity, Robustness and Ruggedness, Error and Uncertainty, Propagation of Uncertainty: Uncertainty When Adding or Subtracting, Uncertainty When Multiplying or Dividing, Uncertainty for Mixed Operations, Uncertainty for Other Mathematical Functions, Statistical Methods for Normal Distributions, Calibrations, Standardizations and Blank Corrections.	
	FUNDAMENTAL THEORETICAL PRINCIPLES OF REACTIONS IN SOLUTION	**(10 Hours)**
	Chemical equilibrium, The law of mass action, Factors affecting chemical reactions in solution, Electrolytic dissociation, Activity and activity coefficient, Solubility product, Quantitative effects of a common ion , Fractional precipitation, Effect of acids on the solubility of a precipitate, Effect of temperature on the solubility of a precipitate, Effect of the solvent on the solubility of a precipitate Acid-base equilibria in water, Strengths of acids and bases, Dissociation of polyprotic acids, Common-ion effect, The ionic product of water, The hydrogen ion exponent, The hydrolysis of salts Hydrolysis constant and degree of hydrolysis, Buffer solutions, Metal ion buffers, Electrode potentials, Concentration cells Calculation of the e.m.f. of a voltaic cell, Oxidation-reduction cells, Calculation of the standard reduction potential, Equilibrium constants of oxidation-reduction reactions.	
	GRAVIMETRY AND TITRIMETRIC METHODS OF ANALYSIS	**(10 Hours)**
	Introduction to gravimetric analysis, Types of Gravimetric Methods, Conservation of Mass, Precipitation Gravimetry, Volatilization Gravimetry, Titrations Based on Acid–Base Reactions, Titrations Based on Complexation Reactions, Titrations Based on Redox Reactions, Precipitation Titrations, Supersaturation and precipitate formation, The purity of the precipitate: Co-precipitation, Conditions of precipitation, Precipitation from homogeneous solution, Washing the precipitate.	

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	QUALITY ASSURANCE	**(10 Hours)**
	Quality Control, Quality Assessment: Internal Methods of Quality Assessment, External Methods of Quality Assessment, Evaluating Quality Assurance Data: Prescriptive Approach, Performance-Based Approach	
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Calibration—Volumetric glassware (burets, pipets, and volumetric flasks)
2	Standardization—External standards, standard additions, and internal standards
3	Effect of Ionic Strength on an Equilibrium Constant
4	Equilibrium Constants for Calcium Iodate Solubility and Iodic Acid Dissociation.
5	The effect of pH on the solubility of $Ca(IO_3)_2$
6	The Solubility of Silver Acetate.
7	Determination of the Thermodynamic Solubility Product, Ksp, of PbI2
8	Determination of Ammonia in Household Cleaners,
9	Acid Rain Analysis by Standard Addition Titration
10	Titration of Chromate–Dichromate Mixtures.

4.	**Books Recommended**
1	Harvey, David, 'Modern Analytical Chemistry' McGraw-Hill Companies, 1st Edition 2006.
2	Harvey, David, Analytical chemistry. -- Seventh edition, Wiley.
3	W. Fifield and David Kealey, Principles and Practice of Analytical Chemistry, 5th Edition University Press, 2012.
4	Vogel A. I. and Mendham J., 'Vogel's Textbook of Quantitative Chemical Analysis Hall, 6th Edition, 2002.
5	D. A. Skoog, F. J. Holler, T. A. Nieman, "Principles of Instrumental Analysis", sixth edition, 2006.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
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Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – I MATHEMATICS FOR CHEMISTRY MA121	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Solve successive differentiations with its applications to different series expansions.
CO2	Apply partial differentiation to find series expansion with error approximations, extremals and jacobians.
CO3	Trace curves in Cartesian, polar, and parametric forms.
CO4	Solve first-order ordinary differential equations with its applications to real world problems.
CO5	Analyse the Linear systems of algebraic equation with different approach.

2.	Syllabus	
	DIFFERENTIAL CALCULUS	**(10 Hours)**
	Differentiation of Hyperbolic and Inverse Hyperbolic functions. Successive Differentiation, standard forms, Leibnitz's theorem and applications, Power series, Expansion of functions, Taylor's and Maclaurin's series. Curvature, Radius of curvature for Cartesian curve with application.	
	PARTIAL DIFFERENTIATION	**(10 Hours)**
	Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem, Taylor's and Maclaurin's series for two variables. Tangent plane and Normal line, Error and Approximation, Jacobians with properties, Extreme values of function of two variables, Lagrange's methods of undetermined multipliers.	
	CURVE TRACING	**(05 Hours)**
	Cartesian, polar and parametric for of standard curves.	
	ORDINARY DIFFERENTIAL EQUATION	**(08 Hours)**
	Reorientation of the differential equation first order first degree, exact differential equation and Integrating factors, Solution of homogenous equations higher order, complementary functions, Particular Integrals, Linear differential equation with variable coefficient	
	APPLICATION OF DIFFERENTIAL EQUATION (MATHEMATICAL MODELLING)	**(07 Hours)**
	Modelling of Real-world problems, particularly Chemical Systems, the spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling, Bending of beam models.	
	SYSTEM OF LINEAR ALGEBRAIC EQUATION	**(05 Hours)**
	Linear systems, Elementary row, and column transformation, the rank of a matrix, consistency of the linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method, Gauss-Jorden Method, Gauss-Jacobi Iteration Method.	

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	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	Differential calculus -I
2	Differential calculus -II
3	Differential calculus -III
4	Partial differentiation-I
5	Partial differentiation-II
6	Curve tracing-I
7	Curve tracing-II
8	Ordinary differential equation-I
9	Ordinary differential equation-II
10	Ordinary differential equation-III
11	Application of differential equation-I
12	Application of differential equation-II
13	System of linear algebraic equation-I
14	System of linear algebraic equation-II

4.	**Books Recommended**
1	J. Stewart, "Calculus," Thomson Asia, Singapore, 1 January 2012.
2	P. O'Neil, "Advanced Engineering Mathematics," Thompson, Singapore, Ind. Ed. 2002.
3	B. Kreyszing, "Advanced Engineering Mathematics," John Wiley & Sons, Singapore, Int. Student Ed. 2015.
4	Wiley C. R., “Advanced Engineering Mathematics”, McGraw Hill Inc., New York Ed. 1993.
5	Bali and Iyengar. Engg. Mathematics, Laxmi Publications, New Delhi, 2004.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – I PHYSICS OF MATERIALS AND NUCLEI PH111	Scheme	L	T	P	Credit
		3	0	0	03

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Define the concept of basic crystallography
CO2	Interpret the importance of the semiconductors and find the parameters of it by Hall effects experiments
CO3	Give brief outline of magnetic materials and classify between conductor and superconductors
CO4	Understand the fundamental of statistical mechanics
CO5	Rephrase the nuclear properties and classify the elementary particles

2.	Syllabus	
	CRYSTALLOGRAPHY	**(10 Hours)**
	Crystalline and amorphous solids, Lattice and unit cell, Seven crystal system and Bravais lattices, Symmetry operation, Miller indices, Atomic radius, Coordination number, Packing factor calculation for SC, BCC, FCC, Bragg's law of X-ray diffraction, Laue Method, Powder crystal method.	
	SEMICONDUCTOR PHYSICS	**(05 Hours)**
	Introduction, Direct and indirect bandgap semiconductors, Intrinsic and extrinsic semiconductors, Law of Mass action, Charge neutrality, Hall Effect.	
	MAGNETIC MATERIALS, CONDUCTORS AND SUPERCONDUCTORS	**(10 Hours)**
	Magnetic materials: Definition of terms, Classification of magnetic materials and properties, Domain theory of ferromagnetism, Hard and soft magnetic materials, Conductors: Classical free electron theory (Lorentz–Drude theory), Electrical conductivity, Super conductors: Definition, Meissner effect, Type I & II superconductors.	
	STATISTICAL MECHANICS	**(10 Hours)**
	Macroscopic and microscopic states, Phase space, Condition for statistical equilibrium, Micro-canonical ensemble, canonical ensemble, Grand-canonical ensemble, Partition function, Bose-Einstein and Fermi-Dirac distribution	
	NUCLEAR AND PARTICLE PHYSICS	**(10 Hours)**
	Nuclear properties and forces, Nuclear models, Shell model, Nuclear reaction, Radioactivity, Types and half-lives, Application in determining the age of rock and fossils, Stellar nucleo synthesis, Fundamental forces, Particle physics, Classification of matter, Quark model, Neutrino properties and their detection.	
		(Total Contact Time: 45 Hours)

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

3.	**Books Recommended**
1	R. Resnick and D. Halliday, Physics (Part I & II), Wiley, 2007.
2	A. Beiser, Concept of the Modern Physics, McGraw-Hill, 2008.
3	K. Huang, Statistical mechanics, Willey, 2008.
4	M. N. Avadhanulu and P. G. Kshirsagar, A text book of Engineering Physics, S Chand, 2009.
5	C. Kittel, Introduction to Solid State Physics, Wiley, 2016.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – II FUNDAMENTALS OF ORGANIC CHEMISTRY CY102	Scheme	L	T	P	Credit
		3	1	2	05

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Impart knowledge in fundamental aspects of organic chemistry.
CO2	Understand and apply concepts of organic chemical structure.
CO3	Predict products, including stereochemistry, in the reactions of alkanes, alkenes, dienes, and cycloalkanes.
CO4	Identify chiral carbons as (R) or (S), identify relationships between pairs of molecules as enantiomers, diastereomers, or equivalent, and identify when a solution is racemic versus optically active
CO5	Know about the types of reactions and mechanisms by realizing the various factors which are affecting the reactions.

2.	Syllabus	
	GENERAL INTRODUCTION	**(06 Hours)**
	Classification of organic compounds and functional groups, Tetra-valency of Carbon, Structural representations of organic compounds. Physical properties of organic compounds: Solubility, Polarity, organic Acid and bases, pKa and pH, Lewis acid and base (hard/soft), dipole moment and substituent effects, types of intramolecular and intermolecular reaction.	
	METHODS OF PURIFICATION OF ORGANIC COMPOUNDS	**(04 Hours)**
	Sublimation, Crystallisation, Distillation (Simple, Fractional, Vacuum and Steam), Differential Extraction.	
	CONCEPTS IN ORGANIC REACTION MECHANISMS	**(09 Hours)**
	Fission of a covalent bond, Nucleophiles and Electrophiles, Electron Movement in Organic Reactions, Electron Displacement Effects in Covalent Bonds, Inductive Effect, Resonance Structure, Resonance Effect, Electromeric Effect, Hyperconjugation and Types of Organic Reactions and Mechanisms (aliphatic and aromatic compounds).	
	STEREOCHEMISTRY OF ORGANIC COMPOUNDS	**(09 Hours)**
	Conformations and configurations of alkanes; molecular chirality, enantiomers, diastereomers, threo- and erythro- diastereomers, meso compounds, resolution of enantiomers, retention and racemization. Relative and absolute configuration, sequence rules, D and L systems of nomenclature and R and S systems of nomenclature. Determination of composition of enantiomers and diastereomers. Geometric isomerism: determination of configuration of geometric isomers E and Z systems of nomenclature, geometric isomers of oximes and alicylic compounds.	
	ORGANIC COMPOUNDS AND REACTIONS	**(09 Hours)**

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

	Structure and properties, relationship between shapes and properties of organic molecules: reactive intermediates, electrophiles and nucleophiles, free radical, carbonium ion and carbanion, carbenes, nitrenes, and arynes, types of organic reactions: stepwise, ionic and free radical mechanisms, single step concerted mechanism, addition, substitution, elimination and rearrangement, method of determining mechanisms (identification of product, isotope effects and determination of reaction intermediates).	
	HYDROCARBONS	**(08 Hours)**
	Structure, preparation and reactions of: alkanes, alkenes and alkynes. Dienes: Nomenclature, classification, methods of formation of butadiene, chemical reactions, conjugated and isolated dienes, resonance stabilization, 1,2- versus 1,4- addition. Cycloalkanes: Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations, theory of strainless ring. Reactions and stereochemistry of substituted cyclohexane.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours + 30 Hours = 90 Hours)	

3.	**Tutorials**
1	Drawing various mechanisms with curly arrow step-by-step.
2	Relative strengths of organic acids and bases.
3	Relative stability of reaction intermediates.
4	Systematic nomenclature of organic compounds
5	Structure and reactivity relationship of organic reactions.
6	Method of determining mechanisms of organic reactions.
7	Nomenclature of cycloalkanes
8	Conformational isomers of alkanes and cycloalkanes
9	Molecular chirality, enantiomers, diastereomers.
10	Meso compounds, racemic mixture. resolution of enantiomers
11	Threo- and erythro- D and L systems of nomenclature and R and S systems of nomenclature.
12	Determination of configuration of geometric isomers E and Z systems
13	Determination of composition of enantiomers and diastereomers.
14	Reactions and stereochemistry of substituted cyclohexane.

4.	**Practical**
1	Filtration, melting point and mixed melting point
2	Demonstration: Purification of liquid organic compounds
3	Simple Distillation (Methanol and water)
4	Determination of boiling point using distillation (Methanol and water)
5	Distillation at reduced pressure (Methanol)
6	Demonstration: Purification of solid organic compounds
7	Crystallization (Benzoic acid)

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8	Crystallization (Acetanilide)
9	Fractional recrystallization (Cinnamic acid and benzoic acid)
10	Sublimation (benzoic acid and sugar)

5.	**Books Recommended**
1	Clayden, J., Greeves, N., & Warren, S. (2012). Organic Chemistry (2nd ed.) Oxford University Press.
2	Carey, Francis A., and Robert M. Giuliano. Organic Chemistry, (10th ed.). New York, McGraw-Hill, 2016.
3	M. B. Smith, Jerry March, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, sixth edition, Wiley-Interscience, 2012.
4	H. Maskill (Ed.), The Investigations of Organic Reactions and Their Mechanisms, first edition, Blackwell Publishing Ltd. Oxford, 2006.
5	V. K. Yadav, Steric and Stereoelectronic Effects in Organic Chemistry, Springer, first edition, 2016

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – II BASIC INDUSTRIAL CHEMISTRY CY104	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Impart knowledge in fundamental aspects of industrial chemistry.
CO2	Acquire knowledge on material and energy balance.
CO3	Describe the composition of different types of glasses.
CO4	Understand different types of ceramics and their uses.
CO5	Describe the steps involved in the manufacturing of cement

2.	Syllabus	
	BASIC CONCEPT	**(10 Hours)**
	Unit operations and unit processes, preparation of flow diagrams, concepts of material balance and energy balance.	
	GLASS	**(09 Hours)**
	Properties and classification silicate and non-silicate glasses. Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, safety glass, borosilicate glass, fluorosilicate, colored glass, photosensitive glass.	
	CERAMICS	**(09 Hours)**
	Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications.	
	CEMENT	**(08 Hours)**
	Classification of cement, ingredients and their role, manufacture of cement and the setting process, quick setting cements	
	EXPLOSIVES	**(09 Hours)**
	Properties and classification of explosives, preparation and explosive properties of nitro-cellulose, TNT, PETN, cyclonite (RDX). Introduction of rocket propellant.	
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	Practical
1	To determine the loss on igniting the cement sample.
2	To determination the total insoluble residue in the cement sample.
3	To determine the total silica in the given sample.
4	To determine the total oxides (Sesquioxides Fe_2O_3 + Al_2O_3) in the given sample.
5	To determine the amount of lime (CaO) in the given sample.

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

6	To determine the amount of Magnesia (MgO) in the given sample.
7	To determine the amount of Iron as Fe_2O_3 in the given sample.
8	Preparation of nitro-cellulose.
9	Synthesis using different unit processes.
10	Synthesis using different unit processes

4.	**Books Recommended**
1	Process calculations (Stoichiommetry) K.A. Ghavane (Nirali Prakashan).
2	Basic Principles & Calculations in Chemical Engineering, David M. Himmelblau (Prentice Hall).
3	J. A. Kent: Riegelís Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4	O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi.
5	S. C. Bhatia: Chemical Process Industries, Vol. I & II, CBS Publishers, New Delhi

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – II CHEMISTRY OF S- AND P-BLOCK ELEMENTS CY106	Scheme	L	T	P	Credit
		3	0	0	03

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Gain knowledge of basic chemistry of main group elements.
CO2	Identify different group elements based on the structure and properties.
CO3	Compare metals, non-metals and noble gases.
CO4	Correlate properties of stoichiometric and nonstoichiometric compounds
CO5	Acquire knowledge about physical aspects involved in manufacturing of inorganic compounds.

2.	Syllabus	
	ALKALI AND ALKALINE EARTH METALS	**(10 Hours)**
	s-Block elements: Physical properties, allotropy, structure and bonding, chemistry, reactivity, oxidation and spectral behavior; Compounds of *s*-block elements: Carbonates, sulphates, nitrides, nitrates, bicarbonates, hydrides; Metallic lithium and its compounds; Metallic sodium, sodium borates; Potassium and its compounds (KOH and K_2CO_3), compounds of beryllium and magnesium; calcium, strontium and barium; and their applications.	
	NOBLE GASES AND NONMETALS	**(10 Hours)**
	General characteristics of *p*- block elements and their compounds: allotropy, structure and bonding, Chemistry and compounds of boron, nitrogen and phosphorous; General characteristics, reactivity and compounds of noble gases, allotropic forms of carbon, carbides of Ca and Si, industrially important organo-silicon compounds, industrial silicone products.	
	HALOGENS AND CHALCOGENS	**(10 Hours)**
	General characteristics; Chemistry and compounds of halogens; inter halogen compounds; Pseudohalogens, peracids and polyhalides; Relative strength of trihalides as Lewis acids; Oxidation-reduction chemistry of Cl_2; Relative strength of oxyacids of halogens; Applications of iodine and iodine compounds; Allotropic forms and significance of sulphur; Reactivity of chalcogens; Compounds of oxygen; Water, H_2O_2, inorganic peroxides and ozone oxides.	
	PROPERTIES & MANUFACTURING OF INORGANIC COMPOUNDS	**(08 Hours)**
	Stoichiometric and Nonstoichiometric compounds, nomenclature of some inorganic compounds, Manufacturing of NH_3, HNO_3 and H_2SO_4.	
	ACIDS AND BASES	**(07 Hours)**
	Acid base concepts: Arrhenius, Bronsted, Lowry and Lewis; Classification of acids and bases as hard and soft. Pearson's HSAB concept, applications of HSAB principle. Relative strength of acids and bases, effect of substituents and solvent on their strength.	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

	(Total Contact Time: 45 Hours)

3.	**Books Recommended**
1	G. L. Miessler, D.A. Tarr, *Inorganic Chemistry*, 3rd Edition, Pearson, 2008.
2	J. D. Lee, *Concise Inorganic Chemistry*, 5th Edition, Wiley-Blackwell, New Jersey, 1999.
3	T. Moeller, *Inorganic Chemistry: A Modern Introduction*, 2nd edition, John Wiley & Sons Inc., New York, 1982.
4	F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann, *Advanced Inorganic Chemistry*, 6th Edition, John Wiley & Sons, New York, 1999.
5	N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements*, 2nd Edition, Butterworth-Heinemann, Massachusetts, 1997.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – II FUNDAMENTALS OF COMPUTER AND PROGRAMMING CS110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Acquire knowledge about computer architecture, network and software development.
CO2	Install an operating system and configure the network along with programming skills to solve the given problem.
CO3	Debug network and operating system related issues and analyse the given problem.
CO4	Evaluate programming solutions with different aspects.
CO5	Design and develop solution for given problems.

2.	Syllabus	
	INTRODUCTION TO COMPUTER AND ITS ARCHITECTURE	**(02 Hours)**
	Introduction and Characteristics, Computer Architecture, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various Units, Processor Speed, Multiprocessor System, Peripheral Buses, Motherboard Demonstration.	
	MEMORY AND VARIOUS INPUT AND OUTPUT DEVICES	**(02 Hours)**
	Introduction to Memory, Input and Output Devices, Memory Hierarchy, Primary Memory and its Types, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning.	
	NUMBER SYSTEMS	**(01 Hour)**
	Introduction and type of Number System, Conversion between Number System, Arithmetic Operations in different Number System, Signed and Unsigned Number System.	
	INTRODUCTION TO SYSTEM SOFTWARES AND PROGRAMMING LANGUAGES	**(04 Hours)**
	Classification of Computer Languages, Introduction of Operating System, Evolution, Type and Function of OS, Unix Commands, Evolution and Classification of programming Language, Feature and Selection of good Programming Language, Development of Program, Algorithm and Flowchart, Program Testing and Debugging, Program Documentation and Paradigms, Characteristics of good Program.	
	WINDOWS OPERATING SYSTEM AND ITS ENVIRONMENT	**(02 Hours)**
	Introduction to GUI based OS, Configuration, Setup, Services, Network Configuration.	
	LINUX OPERATING SYSTEM AND ITS ENVIRONMENT	**(02 Hours)**
	Introduction to Unix based OS, Configuration, Setup, Services, Scripting, Network Configuration.	
	DEBUGGING TOOLS AND COMPILER OPTION	**(04 Hours)**
	Different Debugging tools, Commands, Memory dump, Register and Variable Tracking, Instruction and Function level debugging, Compiler Options, Profile Generation.	
	DATA COMMUNICATION, COMPUTER NETWORK AND INTERNET BASICS	**(02 Hours)**

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

	Data Communication and Transmission media, Multiplexing and Switching, Computer Network and Network Topology, Communication Protocols and Network Devices, Evolution and Basic Internet Term, Getting Connected to Internet and Internet Application, Email and its working, Searching the Web, Languages of Internet, Internet and Viruses.	
	PROGRAMMING USING 'C' LANGUAGE – INTRODUCTION	**(06 Hours)**
	Characteristics of C Language, Identifiers and Keywords, Data Types Constants and Variables, Declarations and Statements, Representation of Expressions, Classification of Operators and Library Functions for Data Input and Output Statements, Formatted Input and Output Statements.	
	PROGRAMMING USING 'C' LANGUAGE – CONTROL STATEMENTS, STRUCTURES, ARRAYS, POINTERS	**(12 Hours)**
	Conditional Control Statements, Loop Control Statements, One Dimensional Array of Numbers and Characters, Two-Dimensional Array, Introduction and Development of User Defined Functions, Different Types of Variables and Parameters, Structure and Union, Introduction to Pointers, Pointer Arithmetic, Array of Pointers, Pointers and Functions, Pointers and structures, File Handling Operations.	
	PROGRAMMING USING 'C' LANGUAGE – FUNCTIONS	**(06 Hours)**
	Functions, Passing the arguments, Return values from functions, Recursion, Header Files Design, File handling operations, Read and Write to Secondary Devices, Read and Write to Input and Output Ports.	
	PROGRAMMING USING 'C' LANGUAGE – GRAPHICS, DEBUGGING	**(02 Hours)**
	Include Graphics Library, Debugging, Linking, Compilation Option for Optimization, Make file.	
	Practical will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Basic commands of Windows and Linux
2	Flow chart drawing and writing pseudo steps or algorithms steps
3	Programming for logic development using different control statements
4	Programming for familiarity with control statement, array, pointers
5	Programming using structures, pointers, programming using functions

4.	**Books Recommended**
1	"Introduction to Computer Science", Fourth Impression, Pearson Education, ITL Education Solutions Limited, 2009.
2	Gottfried B.S., "Programming with C Schaum's outline Series", Outline Series, 2nd Edition, Tata McGraw-Hill, 2006.
3	Brian W. Kernighan, Dennis M. Ritchie, "The C Programming language", 2nd Edition, Prentice Hall PTR publication, 1988.
4	E. Balagurusamy, "Programming in ANSI C", 6th Edition, Tata Mc-Graw Hill, 2012.
5	Pradip Dey, "Programming in C", 2nd Edition, Oxford University Press, 2012.

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

M.Sc.– I (Chem), Semester – II ENGLISH AND PROFESSIONAL COMMUNICATION HS110	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Show enhanced reception towards the use of English language.
CO2	Choose and employ appropriate words for professional communication.
CO3	Develop sentences and text in English coherently and formally.
CO4	Demonstrate overall improvement in oral communication.
CO5	Analyze and infer from written and oral messages.

2.	Syllabus	
	COMMUNICATION	**(05 Hours)**
	Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context	
	VOCABULARY AND USAGE OF WORDS	**(05 Hours)**
	Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.	
	LANGUAGE THROUGH LITERATURE	**(09 Hours)**
	Selected short stories, essays, and poems to discuss nuances of English language.	
	LISTENING AND READING SKILLS	**(06 Hours)**
	Types of listening, Modes of Listening-Active and Passive, Listening and note taking practice, Practice and activities Reading Comprehension (unseen passage- literary /scientific / technical) Skimming and scanning, fact vs opinion, Comprehension practice	
	SPEAKING SKILLS	**(10 Hours)**
	Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice	
	WRITING SKILLS	**(10 Hours)**
	Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, Editing.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

3.	**Tutorials**
1	Letter and Resume
2	Group Discussion
3	Presentation Skills (Individual)
4	Role Play on Nonverbal communication
5	Group Presentation
6	Debate
7	Body language and intercultural communication
8	Listening Activities
9	Editing
10	Report Writing
11	Mock interviews
12	JAM

4.	**Books Recommended**
1	Kumar, Sanjay and Pushp, Lata. *Communication Skills*, 2nd Edition, OUP, New Delhi, 2015.
2	Raman, Meenakshi & Sharma Sangeeta. *Technical Communication Principles and Practice*, 3rd Edition, OUP, New Delhi, 2015.
3	Raymond V. Lesikar and Marie E Flatley. *Basic Business Communication skills for Empowering the Internet generation.* Tata McGraw Hill publishing company limited. New Delhi 2005.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2009.
5	Mike Markel. "Practical Strategies for Technical Communication," Bedford/ St. Martin's Second Edition, 2016
6	Laura J. Gurak and John M. Lannon. "Strategies for Technical Communication in the Workplace," Pearson, 2013.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Chemistry
Five Years Integrated M.Sc. Chemistry

B.Tech.1 /M.Sc. 1 Semester I/ II INDIAN VALUE SYSTEM AND SOCIAL CONSCIOUSNESS HS120	Scheme	L	T	P	Credit
		2	0	0	02

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	interpret the important values that need to be cultivated
CO2	analyse the cultures depicted in Ramayana, Mahabharata, Jainism and Buddhism
CO3	review the structure of Indian knowledge system
CO4	discuss the significance of constitution of India
CO5	demonstrate social responsibility

2.	Syllabus	
	HUMAN VALUES AND CONSCIOUSNESS	**(08 Hours)**
	Human Values Definition and Classification of Values; The Problem of Hierarchy of Values and their Choice; Self-Exploration; 'Basic Human Aspirations; Right understanding, Relationship and Physical Facility; fulfilment of aspirations; Understanding Happiness and Prosperity, Harmony at various levels. What Is Consciousness? ; Can We Build A Conscious Machine?; Levels Of Consciousness; Mind, Matter And Beyond; Holistic Lifestyle; Dealing With Anxiety; Connecting Mind To Brain; Minds, Brains, And Programs.	
	INDIAN CULTURE AND HERITAGE	**(07 Hours)**
	Culture and its salient features: The Vedic – Upanishadic Culture and society, Human aspirations in those societies; Culture in Ramayana and Mahabharata: The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecdotes of the Epics; The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture; The four Noble truths of Buddhism; Vedanta and Indian Culture;	
	INDIAN KNOWLEDGE SYSTEM	**(08 Hours)**
	Indian knowledge as a unique system, Place of Indian knowledge in mankind's evolution, Relevance of Indian knowledge to present day and future of mankind, Nature of Indian Knowledge; Structure of Indian Knowledge: Types of knowledge (para, apara), The scientific and the unscientific, Instruments for gaining and verifying knowledge, Knowledge traditions: Lineages, Instruments - debate, epistemology and pedagogy, The inverted tree – axiomatic, deductive, empirical knowledge, and evolution of knowledge; Disciplines of Study: A brief outline of the subjects, the major contributions and theories along with timelines where	

	relevant: Mathematics; Astronomy; Physical Sciences; Cosmogony; Language studies; Astrology; Moral studies/righteousness; Statecraft and political philosophy	
	INDIAN CONSTITUTION	**(04 hours)**
	History of Making of the Indian Constitution; Philosophy of the Indian Constitution: Preamble; Salient Features; Contours of Constitutional Rights & Duties; Organs of Governance: Parliament; Composition; Qualifications and Disqualifications; Powers and Functions	
	SOCIAL RESPONSIBILITY	**(03 Hours)**
	Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.	
	(Total Contact Time: 30 Hours)	

3.	**Books Recommended**
1	D. K. Chaturvedi, Professional Ethics Values and Consciousness, Ane Books Pvt. Ltd., 2023.
2	R.R. Gaur, R Sangal, G. P. Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
3	A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
4	P R Rao, Indian Heritage and Culture, Sterling Publishers Pvt. Ltd, 1988.
5	D. Singh, Indian Heritage and Culture, APH Publishing Corporation, 1998.
6	Sri Prashant Pole, Treasure Trove of Indian knowledge, Prabhat Prakashan, 2021.
7	Sri Suresh Soni, Sources of our cultural heritage, Prabhat Prakashan, 2018.
8	D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.