

SANKALCHAND PATEL UNIVERSITY, VISNAGAR

Faculty of Science & Humanities



**Structure, Teaching Scheme and Syllabus of
B.Sc. (Honours) Chemistry Sem-3 & Sem-4 as per NEP-2020
Program Code: SC104**

Semester- IV

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Organic Chemistry-IV
Course Code:	14-CHM208-2C
Pre-requisite Course:	Basic Chemistry up to S.Y.B.Sc. (Semester-3)

Course Objectives:

1. To develop the fundamental analytical and industrial skills to work effectively in the different fields of chemistry.
2. Learn the basic concepts of cycloalkanes.
3. Learn the fundamentals of ultraviolet spectroscopy.
4. Learn and understand concepts of carbohydrates.
5. Learn and understand and perform the binary water soluble/insoluble organic solid-solid/solid-liquid/liquid-liquid component mixture.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Saturated Cyclohydrocarbons Nomenclature, Physical and Chemical properties, Preparation methods, Bayer's Strain theory, Orbital picture of angle strain [Coulson and Moffitt's modification (Bent bond/Banana bond)], Sachse Mohr's Concept of Strainless Rings Theory, Heats of combustion and relative stabilities of Cycloalkanes.	15	34
2	Ultraviolet-Visible Spectroscopy: Type of electronic transitions, Effect of conjugation, Concept of Chromophore and Auxochrome. Bathochromic, Hypsochromic, Hyperchromic, and Hypochromic shifts, Woodward –fisher rules, Problems of conjugated enes, enones and aromatic ketones, aldehydes, acids and esters using empirical rules.	15	33
3	Carbohydrates: Introduction, Definition, Classification of Mono Sacharides, Nomenclature, Reactions of Glucose and Fructose (Methylation, Acetylation, Oxidation with Br ₂ water and Conc.HNO ₃ , Reaction with HCN, NH ₂ OH, Osazone formation and Epimerization.	15	33

Reference Books:

1. Organic reaction and mechanism, P.S.Kalsi, New Age international Publishers.
2. Organic Chemistry Vol. I & II, S.M.Mukherji, S.P.Singh, R.P.Kapoor.
3. Reaction mechanism in Organic Chemistry, S.M.Mukhergi, S.P.Singh. 3rd edn, Macmillan.
4. Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R. Chatwal 4th edn, Himalaya Publication House.
5. Organic Chemistry, T.W.GrahamSolomons, 4th edn, John Wiley, 1998.

List of Open-Source Software/learning website:

1. <https://www.organic-chemistry.org>
2. <https://swayam.gov.in>
3. <https://nptel.ac.in>
4. <http://onlinelibrary.wiley.com>
5. https://en.wikipedia.org/wiki/Main_Page

List of Experiments:

Sr.No	Practical Exercise
1.	Separation of binary water soluble/insoluble organic solid-solid/solid-liquid/liquid-liquid component mixture (Any 5 solid-solid/solid-liquid/liquid-liquid mixture)

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Learn and understand about basic concepts of cycloalkanes.	1-Remembering 2-Understanding
CLO2	Learn and understand the fundamentals of Ultraviolet spectroscopy.	1-Remembering 2-Understanding
CLO3	Learn and understand the basic concepts of carbohydrates.	1-Remembering 2-Understanding
CLO4	Learn, understand and perform the binary water soluble/insoluble organic solid-solid/solid-liquid/liquid-liquid component mixture.	2-Understanding 3-Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	1																2	
CLO2		1			2							2						1
CLO3								1										
CLO4			2								1							

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Inorganic Chemistry-IV
Course Code:	14-CHM209-2C
Pre-requisite Course:	Basic fundamental of Inorganic chemistry

Course Objectives:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To make student understand about different terms use in physical chemistry.
3. To develop an actual understanding of acid-base chemistry
4. To learn about the history and classification of organometallic compounds.
5. To understand concepts about Wave Mechanics.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Acids and Bases Brönsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, Factors effecting on acidity and basicity of compounds, Resonance effect (Drawing resonance structures and the conditions for resonance), Inductive and electronic effects, Effect of hybridization, Steric effects, Effects by hydrogen bonding, types of acid-base reactions, levelling solvents, Lewis acid-base, concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle.	15	34
2	O.M.C Definition, Types of O.M.C, Classification, Hepticity of O.M.C, Nomenclature of O.M.C, Structure and bonding in dihapto and metal olifines complexes. e.g. Ziese's salt complexes, ferrocine structure, O.M.C. of Li and Al complexes.	15	33
3	Wave Mechanical concepts: Black Body Radiation & Quantum Theory, Photo electric effect : Wave particle duality of radiation, Compton effect, Basic postulates of quantum Mechanics, Operator : Definition, Algebra of operators, Addition, Multiplication, Commutative properties, Linear operator, Commutator operators, Laplassian operator, Free particle system.	15	33

Reference Books:

Inorganic Chemistry

1. Principles if Inorganic chemistry by B.R.Puri, L.R.Sharma and K.C.Kalia.
2. Inorganic Chemistry by Dr.R.L.Madan, G.D.Tuli.
3. Selected Topics in Inorganic Chemistry by Wahid V. Malik,Tuli,Madan.

List of Open-Source Software/learning website:

1. <https://swayam.gov.in>
2. <https://nptel.ac.in>
3. <http://onlinelibrary.wiley.com>
4. https://en.wikipedia.org/wiki/Main_Page

List of Experiments:

Sr. No.	Practical Exercise
•	Synthesis by Convention Method
1	Ferrous Sulphate or Green vitriol ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$)
2	Sodium cobaltinitrate $\text{Na}_3 [\text{Co}(\text{NO}_2)_6]$
3	Tetra amine cupric sulphate
4	Hexathio urea plumbous nitrate
5	Cuprous chloride

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understanding basic concept of acid and base	1-Remembering 2-Understanding
CLO2	Understanding different properties related to acidity and basicity.	1-Remembering 2-Understanding
CLO3	Learn basic concept of wave mechanics.	2-Understanding
CLO4	Understand types and applications of O.M.C.	2-Understanding 3-Applying
CLO5	Learn Synthesis by Convention Method	2-Understanding 3-Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	1			2													2	1
CLO2		2					1										2	1
CLO3				3													1	
CLO4								2									1	1
CLO5		1															3	2

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Physical Chemistry-IV
Course Code:	14-CHM210-2C
Pre-requisite Course:	Basic fundamental of Physical chemistry

Course Objectives:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To make student understand about different terms use in physical chemistry.
3. To develop an actual understanding of the X-rays diffraction.
4. To learn about the history and application of Nuclear Chemistry.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	NUCLEAR CHEMISTRY. Concept of Nuclear particle, Definition of Isotopes, Isotones, Isobars, Isomers. Packing fraction, Nuclear binding energy, Nuclear coulomb barrier, Rate of ratio active disintegration, half-life period, Average life period, Rutherford & Sodi's law (Group transfer law), Numerical.	15	33
2	X-Ray Diffraction Lattice and Unit cells, Miller Indices, X-ray diffraction, Diffraction by crystal, Single Crystal Diffraction, Powder Crystal Method, X-ray diffraction and Unit cells, Dimensions and the contents of the unit cell, Ionic radii, Covalent radii, Van der Wall's radii, Lattice energies in ionic crystals	15	34
3	Physical Properties & Molecular Structure: The Vacancy Theory of Liquid, Vapor-Pressure, Surface tension, Measurement of surface tension by stalagmometer, Parachor and its applications, Viscosity, Measurement of viscosity by Ostwald-viscometer, Refractive index, Specific refraction, Molar refraction, Measurement of Refractive index by Abbe's Refractometer, Optical activity, Measurement of Optical activity by Polarimeter, Dipole moment and its measurements & its application, Numericals.	15	33

Reference Books:

Physical Chemistry

1. 'Nuclear and Radio Chemistry' by G fried lander, J.W.Kennedy, E.S.maciasandJ.M.Miller, 3rd edn, Johnwiley, 1981.
- Essentials of Nuclear Chemistry' H.J.Arnical, 4th edn, New Age International, 1995.
3. Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.
4. Advance Physical Chemistry by Gurdeep Raj
4. Physical Chemistry (Question and Answers) by R.N.Madan, G.D.Tully, S.Chand.
5. Principal of Physical Chemistry by Puri, Sharma, Pathania.

List of Open-Source Software/learning website:

1. <https://www.physicsclassroom.com/class>
2. <https://swayam.gov.in>
3. <https://nptel.ac.in>
4. <http://onlinelibrary.wiley.com>
5. https://en.wikipedia.org/wiki/Main_Page

List of Experiments:

Sr. No.	Practical Exercise
1.	Conductometric titration: i) CH_3COOH Vs. NaOH ii) CH_3COOH Vs. NH_4OH
2.	pH-metric titration- Callibration of pH-meter by 4- pH buffer i) CH_3COOH Vs. NaOH ii) CH_3COOH Vs. NH_4OH
3	Colorimeter: To determine the concentration of unknown solution from given $\text{K}_2\text{Cr}_2\text{O}_7$ solution by Colorimetry
4	Refractometer: Determine the molar refraction $\text{CH}_3\text{COOC}_2\text{H}_5$, $\text{CH}_3\text{COOC}_3\text{H}_7$ and $\text{CH}_3\text{COOC}_4\text{H}_9$ and show the constancy of reaction equivalent of $-\text{CH}_2-$ Group by Abbe's Refractometer.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understanding Concept of Nuclear chemistry	1-Remembering 2-Understanding
CLO2	Understanding the crystalline structure of the molecules.	1-Remembering 2-Understanding
CLO3	Understand Diffraction by crystal.	2-Understanding
CLO4	Understand Physical Properties & Molecular Structure	2-Understanding 3-Applying
CLO5	Understand different instrumentation with its applications.	2-Understanding 3-Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	1			2													2	1
CLO2		2					1										2	
CLO3				3													3	2
CLO4								2									3	1
CLO5		1															2	

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Name:	Biotechnology applied to plants
Course Code:	14-BIE207-2C
Pre-requisite Course:	--

Course Objectives:

1. The course is designed to acquire basic knowledge of plant tissue culture and simple outline of how the micro propagation done.
2. This will enable the student to understand basics of plant gene transfer. It will also help in acquiring knowledge on artificial gene transfer tools and methods for trans genesis.
3. This course is designed to enable students in understanding the basics and applications of plant tissue culture.
4. Understanding the Applications and Scope of Plant Genetic Engineering.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit No.	Content	Total Hours	Weightage (%)
1	Overview of Tissue Culture Plant Tissue culture: History The laboratory facilities: Equipments and apparatus, Design Concepts of totipotency of cells, Concept of cytodifferentiation/ morphogenesis. Plant tissue culture media: Media composition, Types of media Selection, isolation and preparation of explant Micropropagation and its stages	12	28
2	Physical and chemical methods used for gene transfer in plants Agro bacterium mediated gene transfer in plants, Other biological gene transfers methods Structure of plant gene, Use of different promoters, selectable markers, reporter genes, Plant cloning vectors: Seed terminator technology Chloroplast transformation – a potential alternative to nuclear transformation Transgenic plants: Insect resistance-BT Cotton, herbicide resistance, Disease resistance, Stress tolerance, improvement of crop quality molecular pharming Post-harvest technology: RNAi and antisense RNA technology for extending shelf life of fruits (delay of softening and ripening of fleshy fruits eg. tomato)	17	37

3	Techniques of tissue culture Culture of organized tissues: Root culture, shoot culture, meristem culture, embryo culture, Pollen and anther culture (production and uses of haploids.) Callus culture Protoplast culture: Somatic hybridization and its application. Somatic embryogenesis & Synthetic seeds Cell suspension culture and production of secondary metabolite Cryo preservation of germplasm	16	35
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Text Books:

1. Biotechnology in crop improvement – H S Chawla.
2. Biotechnology-U. Satyanarayan.

Reference Books:

1. Plant biotechnology – J Hammond, et. al., Springer Verlag.
2. Practical application of plant molecular biology – R J Henry, Chapman & Hall.
3. Elements of biotechnology – P K Gupta.
4. An introduction to plant tissue culture – M K Razdan.
5. Plant propagation by tissue culture: The technology (Vols. 1 & 2) – Edwin George.
6. Handbook of plant cell culture (Vols. 1 to 4) – Evans et. al., Macmillan.
7. Plant tissue and cell culture – H E Street, Blackwell Scientific.
8. Cell culture and somatic cell genetics of plants (Vols. 1 to 3) – A K Vasil, A. Press.
9. Plant cell culture technology – M M Yeoman.
10. Plant tissue culture and its biotechnological applications – W Bary, et. al., Springer Verlag.
11. Principles of plant biotechnology: An introduction to genetic engineering in plants – S H Mantel, et. al.
12. Applied and fundamental aspects of plant cell tissue and organ culture edited by Reinert & Bajaj Y P S, Springer Verlag.
13. Plant cell and tissue culture – S Narayanswamy, Tata McGraw Hill Co
14. Das and Mookerjee. Outline of biology.
15. Plant tissue culture K.K. De.
16. Plant and tissue culture Radint and Bhojwani.

List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=EDReGW95EGk>
2. <https://www.youtube.com/watch?v=HHYDmfj4ojk>
3. <https://www.youtube.com/watch?v=vPkI34wXAHl>

List of Experiments:

1. Sterilization techniques: Theory and Practical: Glass ware sterilization, Media sterilization, Laboratory sterilization.
2. Sources of contamination and decontamination measures.
3. Preparation of complex nutrient medium (Murashige & Skoog's medium)
4. To selection, Prune, sterilize and prepare an explant for culture.
5. To study various steps of Micropropagation & to study the significance of growth hormones in culture medium
6. Callus culture development

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the developing an understanding towards fundamentals of plant biotechnology.	2 Understanding
CLO2	List the applications of Plant Biotechnology.	1 Remembering
CLO3	Enabling students to understand types, advantages and disadvantages molecular markers.	2 Understanding,
CLO4	Development of capacity to formulate application of plant biotechnology for production of commercial transgenic plants.	3 Applying, 2 Understanding
CLO5	Learn about biocatalysts, evaluate diseases resistant associated with plant, identify and compare the conventional propagation and micropropagation.	5,3, 4 Evaluate, Applying, Analyze
CLO6	Discuss the mechanisms involved in gene transfer in plant.	6 Creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	2	2	3	3		2	3	1		1	1	3	1					
CLO2	2	3		2	2	2	2	3	2		2	1		1	1	1		
CLO3		2	3			2	2		1	3		3	3					
CLO4	3	3					3	2	3		2	1	1	2	1	2		
CLO5	3	2	2	2	3	2	2			2	1	2						
CLO6	2	1	2	1	2	1		2			2		1	3	2		1	

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Name:	Mathematical Quantum Physics
Course Code:	14-PHE203-2C
Pre-requisite Course:	

Course Objectives:

1. To understand the basic concept of Mathematical physics
2. To know the basic concept of equation of classical mechanics
3. To understand the use of Schrödinger equations in various fields.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Classical Mechanics: Equation of motion (a) Motion Under constant Force(b) Motion under a force which depend on time only(d) Case(1) Motion of Particle subjected to Resistive force Case (2) Motion of Particle falling under the action of gravity near the surface earth , Mechaics of system of Particles, Angular Momentum of the system, (a)Energy of the system, (b)Kinetic energy of the system,(c)Motion of system with variable mass, Related Examples	15	33
2	Physical Interpretation and Condition on ‘Ψ’: Conservation of Probability, Expectation values, Ehrenfest’s Theorem, Admissibility Condition on the Wave function. Stationary States and Energy Spectra Stationary states: The time Independent Schrödinger Equation, A particle in a square well potential, Bound States in a square well ($E > 0$), The square well: Non localized states ($E > 0$).	15	34
3	Fourier series: Introduction, Periodic functions, Application of Fourier series, Average values of a function, Fourier Co-efficient, Diriclet’s conditions, Complex form of Fourier series, Perseval Theorem. Related examples.	15	33

Reference books:

1. Introduction to classical mechanics by R.GTakwalwe and P.S.Purani.
- 2.Element of properties of metal By D.S Mathur
3. Quantum mechanics by P M Mathews
4. Mathematical Physics by B.D.Gupta
5. Physic Paper 402. Semester 4 NiravPrakashan

List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=OKn6Mb9xtYU>
2. <https://www.youtube.com/watch?v=Mw3I-a-QOXo>

List of Experiments:

1. Resonance Pendulum. Determination of 'l', 'r' & 'a'
2. Study of X-ray diffraction(Powder) Pattern
3. Decay of Temperature when body is allowed to cool.(thermocouple)
4. To study Characteristics of UJT. Plot graph $V_E - I_E$
5. Low resistance by projection method.
6. To find the wave length of given monochromatic Source (newton ring)
7. To find the frequency response of a R.C Coupled emitter
8. Melde experiments(i) to prove p^2 Constant

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the Conservation of Probability	1 Remembering
CLO2	Discuss the Motion under constant force which depend on time only	2 Understanding
CLO3	Illustrate the numerical part related to Classical and Mathematical physics.	3 Applying
CLO4	Explain Mechanics of system of particles	4 Analyzing
CLO5	Justify the time independent Schrödinger equation	5 Evaluating
CLO6	Evaluate the complex form of fourier series	6 creating

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1		1																
CLO2			2															
CLO3	3																	
CLO4			2														1	
CLO5			2															
CLO6			1															

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
ProgramCode:	SC103
CourseName:	Grammar and Communication Skill-II
CourseCode:	14-AEC204-2C
Pre-requisiteCourse:	Basics English Grammar Basics English up to S.Y.B.Sc.

Course Objectives:

1. To inculcate human values among the students through poems and prose.
2. To create an interest in literature and to develop language skills.
3. The students will become familiar with formal vocabulary that is common in academic texts.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	VOCABULARY&GRAMMARLINK Prefix-Suffix, Gerund and Participle, Concord, Apply capitalization and comma use rules. Sentences: Simple Sentences, Compound Sentences, Complex Sentences.	9	30
2	SPEAKING conversations: - College/School related conversations: - Parent – teacher, Advice from a teacher, Admission to a college, Getting ready for a school trek. Family conversations: - A family get together, Cleaning the house, Sharing the day's experiences Job related Enquiries: - Job seekers' course , Job seekers - a discussion , Job opportunities , Short courses during a vacation	6	20
3	READING&WRITING Paragraph Writing. List of Topics for Paragraph Writing: Personal: (a) My Ambition in Life (b) India - My Country (c) College Life (d) My Favorite Movie State/ nation/ media: (a) My City/ Village (b) My Favorite Sports person (c) Gandhi Ashram (d) Importance of English in India Environment/ social life: (a) Pollution (b) Traffic Awareness (c) Trees – Our Best Friends (d) Gender Discrimination Translation: - Translate the Accident/Incident Paragraphs given by your teacher from the English News Papers (Teacher has to give small paragraphs at least 5 to 6 paragraphs or more than that for the entire semester based on especially from the pages no. 3 & 4 of The Times of India)	6	20
4	TEXT Glimpses of Life-An Anthology of Short Stories (Orient Black Swan) Lesson 8 to 12	9	30

Text Books:

1. Glimpses of Life-An Anthology of Short Stories (Orient Black Swan)
2. Easy to learn English grammar by Dr.Jayesh Patel

Reference Books:

1. Very Useful Verbs book (Enka Publication)
2. Contemporary English Grammar Structure & Composition
3. Murphy R. Intermediate English Grammar(New Delhi: Cambridge University)
4. The Art of Public Speaking by Vijay Kumar.
5. The Times of India/The Indian Express
6. Business Correspondence and Report Writing by R.C Sharma & Krishna Mohan.

List of Open Source Software/learning website:

1. englishpage.com
2. epaper.timesofindia.com
3. epaperindianexpress.com
4. <https://www.youtube.com/watch?v=QdAgyD4xhY>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe how public speaking can be used to advocate or create change	1 Remembering
CLO2	Explain the goals and benefits of public speaking	2 Understanding
CLO3	Use parallel structures correctly and effectively.	3 Applying
CLO4	Identify strategies for researching and supporting a speech	4 Analyzing
CLO5	Recognize when to use visual aids	3 Applying
CLO6	Describe how public speaking can be used to advocate or create change	6 Creating

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	3					2					2					3		
CLO2		2			2		1					1			2			
CLO3			3					1					3			2		
CLO4		2					3					2					1	
CLO5															3			
CLO6	1					1					1					2		

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Name:	Sound Engineering
Course Code:	14-SEC215-2C
Pre-requisite Course:	

Course Objectives:

1. Develop and actual Understanding about acoustics
2. To Know the basic Factor effecting acoustic of Building and their remedies
3. To know Microphone appliances in physical world.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Sound: Microphones,CarbonMicrophone,Condenser,Microphone,Loudspeaker-(i) Fixed coil or moving iron type loudspeaker and (ii) Moving coil type loudspeakerRecording of sound: Miller Phonodiek, phonograph-recording and reproduction	15	50
2	Architectural Acoustics: Introduction Classification of sound, Classification of audible sound Intensity Intensity level, LoudnessAbsorption coefficient, Reverberation and reverberation time. Measurement of aborsption coefficient , Factors Affecting Acousticas of Building and their Remedies	15	50

Reference Books:

1. A Textbook of Oscillations, Waves and Acoustics
2. Engineering Physics by G Vijayakumari, Vikas Publishing house pvt LTD
3. Engineering Physics by N. Avadhanulu, S. Chand & company

List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=yQL5b-aNCKU>
2. <https://www.youtube.com/watch?v=11w5zELCaTg>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the Microphones.	1 Remembering
CLO2	Discuss the construction of Loud speaker.	2 Understanding
CLO3	Compare the Carbon Microphone, Condenser and Loud speaker	3 Applying
CLO4	Explain the loudness of Absorption coefficient	4 Analyzing
CLO5	Evaluate the factors affecting Acoustics of Building and their Remedies	5 Evaluating
CLO6	Design the auditorium using Acoustic Effect of sound	6 Creating

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1		2																
CLO2		3																
CLO3					2													
CLO4						1												
CLO5					2													
CLO6			3															

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Name:	Business Mathematics-IV
Course Code:	14-SEC216-2C
Pre-requisite Course:	

Course Objectives:

1. To understand basic concept of Laplace Transforms and its Properties.
2. To understand basic concept of Inverse Laplace Transforms.
3. To know about Convolution Theorem.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Laplace transform- Definition and its properties. Rules of manipulation. Laplace transform of derivatives and integrals.	15	50
2	Properties of inverse Laplace transform. Convolution theorem. Solve Differential equation using Laplace Transforms.	15	50

Reference Books:

1. The Laplace Transform: Theory and applications, by Joel L. Schiff.
2. Schaum's outline of Laplace Transforms, by Murray Spiegel.

List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=9RJml41PFn>
2. https://www.youtube.com/watch?v=FdVS3tSilZ4&list=PLNKD1qB9pptsco8EAskJWA RKrXQze2r_Y

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe basic concept of Laplace Transforms and its Properties.	1 Remembering
CLO2	Explain Laplace Transforms for derivatives and Solve its example.	4 Analysing 3 Applying
CLO3	Illustrate Laplace Transforms for Integrals.	3 Applying
CLO4	Describe Properties of Inverse Laplace Transforms.	1 Remembering
CLO5	Discuss Convolution theorem.	2 Understanding
CLO6	Solve Differential equation using Laplace Transforms.	3 Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	2	1			1	1												
CLO2	2	2			1	1												
CLO3	2	1			1	1												
CLO4	1	2			1	1												
CLO5		1			1	1												
CLO6	1	2			1	2												

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Pharmaceutical chemistry
Course Code:	14-SEC217-2C
Pre-requisite Course:	-

Course Objectives:

1. To meet the growing demand of Specialization and Advanced Courses in applied science.
2. To make student understand about different terms use in green chemistry.
3. To learn about the basic concepts about green chemistry.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Introduction to Pharmaceutical Chemistry and pharmacopeia. Impurities in Pharmaceutical substances: Sources of impurities, limit tests for iron, arsenic, lead, heavy metals, chloride and sulphate. Essential and trace elements: Transition elements and their compounds of Pharmaceutical Importance: Iron and haematinics, mineral supplements.	15	50
2	An outline of methods of preparation, properties [Chemical and physical]purity, identity assay principle of the following class of compounds. 1:Gases and Vapours: Oxygen, Anesthetics 2: Complexing and Chelating agents used in therapy 3: Dental products: Dentifrices, Anti-caries agents 4: Antidotes, Sclerosing agents 5: Inhalants, Anaesthetics and Respiratory stimulants	15	50

Reference Books:

1. G.R. Chatwal, Pharmaceutical inorganic chemistry, volume-I, Himalaya Publishing house, Indi
2. Bently and Driver, Textbook of Pharmaceutical Chemistry, Oxford university Press, 8th Edition, 1987
3. Practical Pharmaceutical Chemistry edited by A.H. Beckett, J.B. Stenlake, CBS Publication Indian edition.
4. Indian Pharmacopoeia, Latest Edition, Controller of publications, Delhi.

List of Open-Source Software/learning website:

1. <https://nptel.ac.in>
2. https://en.wikipedia.org/wiki/Main_Page

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Learn basics of pharmaceutical chemistry and pharmacopeia.	1-Remembering 2-Understanding
CLO2	Learn and understand impurities in pharmaceutical substances.	1-Remembering 2-Understanding
CLO3	Understand properties of some compounds related to pharmaceutical chemistry	1-Remembering 2-Understanding
CLO4	Learn and understand methods of preparation of some pharmaceutical products and reagents.	2-Understanding 3-Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1	1																2	
CLO2		1			2							2						1
CLO3								1										
CLO4			2								1							

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Name:	Environmental Science
Course Code:	14-VAC202-2C
Pre-requisite Course:	Basic knowledge of 11-12 th Science

Course Objectives:

1. To provide students with a broad interdisciplinary liberal arts framework for understanding the relationship between humans and their environment.
2. To prepare students for careers, citizenship and environmental stewardship through experiential curricular and co-curricular opportunities.
3. To equip students with the knowledge and skills necessary to pursue professional careers and advanced study related to the multi-faceted nature of environmental studies.
4. Students by offering this course will get proper understanding of important aspects that affects environment and ecology

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
			T	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Content	Total Hours	Weightage (%)
1	Introduction to Environment and Environmental Studies: Definition and Components of Environment, Relationship between the different components of Environment, Man and Environment relationship, Impact of technology on Environment, Environmental Degradation, Multidisciplinary nature of the Environment studies, its scope and importance in the present day Education System Ecology and Ecosystems: Introduction: Ecology- Objectives and Classification , Concept of an ecosystem- structure and functions of ecosystem Components of ecosystem- Producers, Consumers, Decomposers Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Energy Flow in Ecosystem, Food Chains, Food webs ,Ecological Pyramids Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem.	15	50
2	Human Population and Environment: Population Growth, World and Indian scenario, Population and Environmental Degradation, Malthusian theory, Optimum theory, Population explosion – Causes, Effects and Control. Urbanization: Urban population growth and Environmental problems Environmental pollution: Types of Environmental Pollution: 1) Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial, Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Eutrophication 2) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO₂, NO_x, Natural & Anthropogenic Sources, Effects of common air pollutants	15	50

3) Land Pollution: Land uses, Land degradation: causes, effects and control, soil erosion 4) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects 5) Thermal Pollution: Causes and effects Role of individual in the prevention of pollution		
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Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha Second edition,2013 Publisher:Universities Press (India) Private Ltd, Hyderabad.

Reference Books:

1. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP -Lambert Academic Publishing, Germany
2. Environmental Studies by AninditaBasak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
3. Textbook of Environmental Studies by Deeksha Dave & S SKateva ,Cengage Publishers.
4. Environmental Sciences by Daniel B Botkin& Edward A Keller Publisher: John Wiley & Sons.
5. Environmental Studies by R. Rajagopalan, Oxford University Press
6. Environmental Studies by Benny Joseph, TMH publishers
7. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria& Sons New Delhi
8. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill

List of Open Source Software/learning website:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=0Xvq9yUM2ILDrJ07FvlArQ==>
2. <https://nptel.ac.in/courses/120108004>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving	3 Apply
CLO2	Demonstrate an integrative approach to environmental issues with a focus on sustainability;	2 Understanding
CLO3	Communicate complex environmental information to both technical and non-technical audiences.	2 Understanding 3 Apply
CLO4	Understand and evaluate the global scale of environmental problems.	1 Remembering 2 Understanding
CLO5	Predicting the consequences of human actions on the web of life, global economy and quality of human life	1 Remembering 2 Understanding
CLO6	Adopting sustainability as a practice in life, society and industry	2 Understanding

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1													3	1				
CLO2		2			3	1						2		1				
CLO3				1						3				1		2		
CLO4	1											3		1				
CLO5							2							1				
CLO6			3					1						1				

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Integrated Personality Development Course
Course Code:	14-VAC203-2C
Pre-requisite Course:	Zeal to Learn the Subject

Course Objectives:

1. To provide students with a holistic education – focused on increasing their intelligence quotient, spiritual quotient, emotional quotient and physical quotient.
2. To provide students with hard and soft skills, making them more marketable when entering the workforce.
3. To educate students on their social responsibilities as citizens of India and have a greater sense of social responsibility.
4. To provide students with a value-based education this will enable them to be successful in their family, professional, and social relationships by improving their moral and ethical values.
5. To teach self-analysis and self-improvement exercises to enhance the potential of the participants.
6. To have a broader sense of self-confidence and a defined identity

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit P	Theory (Marks)		Viva Voce (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
-	-	4	2	-	-	25	25	50

Course Contents:

Unit No	Content	Total Hours	Weightage (%)
1	The Need for Values, Remaking Yourself , Restructuring Yourself, Power of Habit Learning from Legends , Tendulkar & Tata From House to Home , Listening & Understanding	20	34
2	Facing Failures - Welcoming Challenges, Significance of Failures My India My Pride - Glorious Past-Part 1, Glorious Past-Part 2 Learning from Legends - A.P.J. Abdul Kalam Soft Skills - Networking & Leadership, Project Management	20	33
3	Remaking Yourself - Handling Social Media Facing Failures - Power of Faith From House to Home - Bonding the Family Selfless Service - Seva	20	33

Text Books:

1. **IPDC Workbook-1** (Presented by B.A.P.S. Swaminarayan Sanstha)

Reference Books:

1. Thomas Edison's factory burns down, New York Times Archives, Page 1, 10/12/1914
2. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder & Stoughton, 2014
3. The Rise of Civilization in India and Pakistan, Raymond Allchin, Bridget Allchin, Cambridge University Press, 1982
4. Seven Habits of Highly Effective Teens, Sean Covey, Simon & Schuster, 2012

List of Open Source Software/learning website:

1. <https://www.youtube.com/watch?v=r6LtC1prqLs>
2. <https://www.youtube.com/watch?v=oxoZW6RMspI>
3. <https://www.youtube.com/watch?v=FWCTTsAR4Zg>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To provide students with a holistic value-based education that will enable them to be successful in their academic, professional, and social lives.	1 Remembering 2 Understanding 3 Applying
CLO2	To give the students the tools to develop effective habits, promote personal growth, and improve their wellbeing, stability, and productivity.	1 Remembering 2 Understanding 3 Applying
CLO3	To allow students to establish a stronger connection with their family through critical thinking and devolvement of qualities such as unity, forgiveness, empathy, and effective communication.	1 Remembering 2 Understanding 3 Applying
CLO4	To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.	1 Remembering 2 Understanding 3 Applying
CLO5	To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the betterment of their family, college, workforce, and nation.	1 Remembering 2 Understanding 3 Applying
CLO6	To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.	1 Remembering 2 Understanding 3 Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2
CLO1								1			1	1			1		1	
CLO2		1		2			1				1	2			2			
CLO3		1	2				1				2	2	1		2			
CLO4											3	1	2		1		1	
CLO5								2			1	2		3	2			
CLO6								1			2	3						

3: High, 2: Medium, 1: Low