

Program Outcomes (PO)

PO-1: Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Organic, Inorganic, Physical and Analytical Chemistries.

PO-2: To develop critical thinking, students carry out scientific experiments as well as accurately record and analyze the results of such experiments.

PO-3: Students will be skilled in independent problem solving, critical thinking and analytical reasoning as applied to scientific problems.

PO-4: Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

PO-5: Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, environment, health and medicine.

PO-6: To inculcate the scientific temperament in the students and outside the scientific community.

PO-7: To develop skills in the proper handling of apparatus and chemical. To be exposed to the different processes used in industries and their applications.

Program Specific Outcomes (PSO)

After successful completion of the course the student will be able to:

PSO-1: have sound knowledge about the fundamentals and applications of chemical and scientific theories.

PSO-2: demonstrate knowledge and understanding of essential facts, concepts, principles, and theories related to the subject.

PSO-3: acquire technical skills required for synthesis, Identification, and structural characterization of chemical compounds.

PSO-4: apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories. Handling of basic equipment, acquiring technical skills accurately and effectively communicate scientific ideas in graphic oral and written form;

PSO-5: be familiar with the different branches of chemistry like analytical, organic, inorganic, physical, environmental and polymer;

PSO-6: gain knowledge to correlate Chemistry with other disciplines of science;

PSO-7: help in understanding the causes of environmental pollution and can open up new methods for environmental pollution control;

PSO-8: develop analytical skills and problem-solving skills requiring application of chemical principles.

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs: B.Sc. Chemistry-VI						
Course Name	Inorganic Chemistry		Course Code	1091601		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To understand define point group, Classification of molecules into point-groups, point – group of different molecules. ✓ To understand reaction mechanisms of ligand substitution in octahedral complexes (i) SN^1 (ii) SN^2 Acid hydrolysis and Base hydrolysis-Redox (Single Electron Transfer) reactions. ✓ To study water pollution: types of water pollutants, trace elements in water and their effects. 					
Course Content	Unit I: The Molecular Conformation Analysis Introduction and importance of symmetry, Symmetry elements and Symmetry operations, Classification of molecules in to point groups. Point group of simple molecules like CO_2 , HCl , H_2O , NH_3 , BF_3 , $[PtCl_4]^{-2}$, PF_5 , C_6H_6 , $C_5H_5^-$, CH_4 , SF_6 , Bromo benzene (C_6H_5Br), Cyclobutene, Boric acid (H_3BO_3), Cis and Trans Dichoro ethylene ($C_2H_2Cl_2$), Staggered and Eclipsed Ethane (C_2H_6). Law of multiplications, Construction of multiplication table for C_{2v} , C_{3v} , C_{2h} .					8 hours
	Unit II: Inorganic Reaction Mechanism Reaction mechanisms of ligand substitution in octahedral complexes (i) SN^1 (ii) SN^2 , Acid hydrolysis & Base Hydrolysis-Redox (Single Electron Transfer) reactions, Substitution reaction without breaking M-L bond.					7 hours
	Unit III: Organo-metallic Compounds Definition, classification, Structure and bonding in ferrocene, benzene chromium, Zeise ion and gaseous dimethyl beryllium, Tetramethyl lead.					8 hours

	<p>Unit IV: Water Pollution & its effects</p> <p>Types of water pollutants, Trace elements in water and their effects; Determination of BOD, COD, DO, Total hardness, Total dissolved solids, Ozone treatment process for waste water.</p>	7 hours
Teaching Methodology	Classwork, Discussion, Self-Study, Seminars and/or Assignment.	
References	<ul style="list-style-type: none"> ✓ introduction to quantum chemistry, by A. K. Chandra, Tata Mc. Graw Hill, Delhi ✓ Quantum mechanics in chemistry by M. H. Hanna ✓ Theoretical Inorganic chemistry by Day & Selbin, Affiliated East West ✓ Advanced Inorganic Chemistry by Cotton and Wilkinson, John Wiley ✓ Uni. Chemistry by B. H. Mahan ✓ Structural Inorganic chemistry by A. F. Wells. <ul style="list-style-type: none"> ✓ Chemical Bonding- an introduction By Rawal, Patel & Patel.Sugumar. ✓ Environmental Chemistry by AmrithaAnand ✓ Basic Inorganic Chemistry by Cotton and Wilkinson ✓ A Text book of Inorganic Chemistry by P.L.Soni ✓ Introduction to Inorganic Chemistry by Durrant and Durrant ✓ Modern Co-ordination Chemistry by R. Lewis and R.G. Wilkinson. ✓ Inorganic Chemistry- Principles of structure and reactivity by J.E. Huhhey and E.A. Keiter. 	
Course Outcomes	<ul style="list-style-type: none"> ✓ CO-1: define symmetry, symmetry elements, symmetry operations. ✓ CO-2: define point group, Classification of molecules into point- groups, point – group of different molecules. ✓ CO-3: derive the multiplication table for C_{2v}, C_{3v} and C_{2h} point group ✓ CO-4: understand reaction mechanisms of ligand substitution in octahedral complexes (i) SN^1 (ii) SN^2 Acid hydrolysis and Base Hydrolysis-Redox (Single Electron Transfer) reactions ✓ CO-5: study water pollution: types of water pollutants, trace elements in water and their effects; Determination of BOD, COD, DO, Total hardness, Total dissolved solids, Ozone treatment process for waste water. 	

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO7	PSO8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
CO1		Y						Y			Y					K1
CO2		Y														K2
CO3								Y								K3
CO4		Y			Y											K4
CO5						Y										K5,K6

High-3 Medium-2 Low-1

K₁ =>Remember K₂ =>Understand K₃ =>Apply K₄ =>Analyze K₅ =>Evaluate K₆ =>Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs: B.Sc. Chemistry-VI						
Course Name	Organic Chemistry		Course Code	1091602		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To study mechanism of rearrangements involving C to C and C to N. ✓ To understand green chemistry and its effects. ✓ To study basic concept of Dyes and its uses. ✓ To understand have general introduction of carotenoids, analytical and synthetic evidence of βcarotene. 					
Course Content	Unit I: Green Chemistry					7 hours
	Introductions, Definition, Fundamental Principle of Green Chemistry. Green synthesis of (i) Ibuprofen (ii) Paracetamol.					
	Unit II: Molecular Rearrangements					8 hours
Mechanism of rearrangements involving C to C migrations as illustrated by Wagner-Meerwein and Pinacol-Pinacolone rearrangements. Mechanism of rearrangements involving C to N migrations as illustrated by Hoffmann and Beckmann rearrangements.						
Unit III: Terpenoids					8 hours	
Their occurrence, classification, isoprene and special isoprene rule, general methods to determine their structure, analytical and synthetic evidences for the structure of Camphor & Citral.						

	<p>Unit IV: Synthetic Dyes</p> <p>Definition and difference between dyes and pigments, classification of dyes, color and constitution-Witt's theory, synthesis and uses of Crystal violet, Indigo, Alizarine, Phenolphthalein, Tetrazine, Acriflavine, Procion Brilliant Red M-2B.</p>	7 hours
Teaching Methodology	Classwork, Discussion, Self-Study, Seminars and/or Assignment.	
References	<ul style="list-style-type: none"> ✓ Mechanism and Structure in organic chemistry-Goulde ✓ Reaction mechanism in organic chemistry by Mukhejee &Singh ✓ Principles of reaction mechanism in organic chemistry by Dharmaraha &Chawla ✓ Organic reaction mechanism by Bansal Tata Mac.Hill ✓ Organic Chemistry by Hendrickson, Cram &Hammond ✓ Organic Chemistry by Brown R.F. ✓ Organic Chemistry by Solomon W.Graham ✓ Principles of Organic Synthesis- R. O. C.Norman ✓ Basic Principles of Organic chemistry, by R. Y. Caserio, W. A.Benjamin ✓ May's Chemistry of synthetic Drugs byDyson ✓ Chemistry of drugs, Ener and Caldwell ✓ Synthetic drugs by TyagiandYadav ✓ Chemistry of synthetic Dyes Vol. I & II byVenkatraman ✓ Synthetic Organic Chemistry by O. P.Agarwal ✓ Synthetic Dyes by Chatwal &Anand ✓ Chemistry of synthetic Dyes by I. G.VashiOrganic reactions & their mechanism by P. S. Kalsi, New age international publishers. 	
Course Outcomes	<ul style="list-style-type: none"> ✓ CO-1: have basic concept of green chemistry, fundamental principle of green chemistry, green chemistry examples, green synthesis of important compounds ✓ CO-2: have general introduction of carotenoids, analytical and synthetic evidence of βcarotene; ✓ CO-3: classify dyes with example, introduction of various types of dyes; ✓ CO-4: study mechanism of rearrangements involving C to C migrations as illustrated by Wagner – Meerwein and Pinacol-Pinacolone rearrangements; ✓ CO-5: study mechanism of rearrangements involving C to N migrations as illustrated by Hoffmann and Beckmann rearrangements. 	

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
CO1	Y			Y					Y							K1
CO2										Y						K2
CO3																K3
CO4				Y			Y								Y	K4
CO5		Y													Y	K5

High-3 Medium-2 Low-1

K₁ =>Remember K₂ =>Understand K₃ =>Apply K₄ =>Analyze K₅ =>Evaluate K₆ =>Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs: B.Sc. Chemistry-VI						
Course Name	Physical Chemistry		Course Code	1091603		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To study physical, thermal, flow and mechanical properties and application of various polymers. ✓ To understand and explain partial molal free energy, derive from Gibb's Duhem equation, chemical potential in case of a system of ideal gases, concept of fugacity, fugacity function, fugacity at low pressures, physical significance of fugacity ✓ Explain Stable and unstable isotopes, separation of isotopes by different methods, gaseous diffusion, thermal diffusion, distillation, chemical exchange methods. 					
Course Content	Unit I: Application of Electromotive Force Application of measurements of EMF in the determination of (1) Solubility product and solubility of sparingly soluble salts (2) Ionic product of water by galvanic cell (3) Transport number of ions (4) Equilibrium constant (5) pH by Hydrogen, Glass and Quinhydrone electrodes (6) Energy sources Ni-Cd Cell and Li- ion Cell, Lithium - Polymer Cell					8 hours
	Unit II: Binary Liquid Mixtures Liquid-liquid mixtures, ideal liquid mixtures, Raoul's law, non-ideal orreal solutions, positive and negative deviations from Raoult's law, temperature composition curves for ideal and non-ideal binary solutions of miscible liquids, azeotropes, partially miscible liquids: Phenol-water systems, immiscible liquids, steam distillation, Chemical Potential of Ideal and nonidealsolutions, Numerical problems.					7 hours
	Unit III: Applications of Nuclear Chemistry Application of radio isotopes as tracers in medicines, agriculture, in studying reaction mechanism in photosynthesis and age determination					8 hours

	<p>by Carbonating method, Geiger Muller Counter, Q-value of nuclear reactions, Chemical and physical atomic weight scale, Mass defect and Binding energy, Packing fraction and its relation with the stability of the nucleus, Nuclear fission, Atom bomb, Nuclear reactor for power generation and Critical mass, Nuclear fusion, Stellar energy and Hydrogen bomb, Hazards of nuclear radiation. Numerical problems on Q-value, binding energy, packing fraction, and energy released during nuclear reactions.</p>	
	<p>Unit IV: Phase Equilibria</p> <p>Phase Equilibria Statement and meaning of the terms phase, component, degree of freedom, phase rule, phase equilibria, of one component system-water, CO₂, Sulphur system, phase equilibria of two component system-simple eutectic, PbAg systems, desilverisation of lead, KI-Water system, freezing mixtures. Solid solutions: compounds with congruent and incongruent melting point (Only definition and example), Three component solid-liquid systems.</p>	7 hours
Teaching Methodology	Classwork, Discussion, Self-Study, Seminars and/or Assignment.	
References	<ul style="list-style-type: none"> ✓ Elements of physical chemistry by Glasstone and Lewis ✓ Physical chemistry by G.M. Barrow ✓ Physical chemistry by W. Moore ✓ Physical chemistry by Puri, Pathania, Sharma ✓ Essential of Physical chemistry by Bahl and Bahl ✓ Nuclear chemistry by Arnikaar ✓ Electro chemistry by S. Glasstone ✓ Electrochemistry by B.K.Sharma ✓ Physical chemistry by Baliga, Dhavale and Zaveri Vol 1-3. ✓ Physical chemistry by Negi and Anand ✓ Physical chemistry by K.L. Kapoor Vol-5. ✓ Physical chemistry by Dr. S.Pahari ✓ Nuclear chemistry by Arnikaar ✓ Electro chemistry by S.Glasstone 	
Course Outcomes	<p>CO-1: discuss application of radio isotopes as tracers in medicines, agriculture, in studying reaction mechanism in photosynthesis and age determination by Carbon-Dating method, Q-value of nuclear reactions, chemical and physical atomic weight scale, mass defect and binding energy, packing fraction and its relation with the stability of the nucleus, nuclear fission, atom bomb, nuclear reactor for power generation and critical mass, stellar energy and hydrogen bomb, hazards of nuclear radiation, numerical problems on Q-value, binding energy, packing fraction, and energy released during nuclear reactions.</p> <p>CO-2: apply EMF measurements in the determination of (1) solubility product and solubility of sparingly soluble salts (2) ionic product of water by galvanic cell (3) transport number of ions (4) equilibrium constant (5) pH by hydrogen, glass and quinhydrone electrodes, solve numerical based on above applications to determine solubility, solubility product, ionic product of water, equilibrium constant, transport number and pH of solution, have detail information on energy sources like Ni-Cd Cell and Li- ion cell.</p> <p>CO-3: discuss statement and meaning of the terms phase, component, degree of</p>	

freedom, phase rule, phase equilibria of one component system like water, CO₂, sulphur system, phase equilibria of two component system like Pb-Ag systems, KI-Water system, desilverisation of lead, basics freezing mixtures and Definition of solid solutions with congruent and incongruent melting point using example'

CO-4: explain liquid-liquid mixtures, ideal liquid mixtures, Raoult's law, non-ideal or real solutions, positive and negative deviations from Raoult's law, temperature composition curves for ideal and non-ideal binary solutions of miscible liquids, azeotropes, partially miscible liquids explained using phenol-water systems, immiscible liquids, steam distillation, solve numerical problems related to this topic.

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
CO1	Y										Y				K1
CO2				Y					Y					Y	K2,K3
CO3		Y							Y		Y				K4,K5
CO4			Y								Y				K6

High-3 Medium-2 Low-1

K₁ =>Remember K₂ =>Understand K₃ =>Apply K₄ =>Analyze K₅ =>Evaluate K₆ =>Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs : B.Sc. Chemistry-VI						
Course Name	Industrial Chemistry		Course Code	1091604		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To understand define nitration, Nitrating agent, Reaction mechanism of Nitration. ✓ To Undersatnd define Sulphonation, methods of sulphonation, sulphonating agents, mechanism of sulphonation. ✓ To understand Learn small scale preparation of compunds ✓ Study manufacture of Freon-12 from fluorspar, Manufacture of freon-12 from vinylidene fluoride. ✓ To Understand define amination, Amination by reduction and Aminatition by amonolysis. 					
Course Content	Unit I: Pulp and Paper industry					
	Type of pulp, Manufacture of chemical pulp by sulphate pulp process, sulphite pulp process, manufacture of paper (conversion of pulp into paper, beating process, importance of fillings, sizing, colouring materials in manufacture of paper and calendaring).					8 hours
	Unit II: Insecticides and Fungicides					
	Introduction, inorganic insecticides, natural and synthetic insecticides, organic insecticides, Eldrin, Dieldrin, BHC, Tetra ethyl pyrophosphate (TEPP), introduction of Fungicides like Bordeaux mixture, Dithio carbamates, Baygon, Termik, Zineb.					7 hours
	Unit III: Fermentation Industry					
	Definition, condition favorable for fermentation process (pH, temperature, presence of other substances, absence of preservatives, concentration), manufacture of ethanol, citric acid, acetone and butanol, acetic acid, lactic acid from molasses, manufacture of penicillin-G.					8 hours

	<p>Unit IV: Sugar Industry</p> <p>Introduction, Manufacture of sugar from sugarcane, Extraction of juice, Purification of juice, Concentration & crystallization of purified juice, Refining of sugar.</p>	7 hours
Teaching Methodology	Classwork, Discussion, Self-Study, Seminars and/or Assignment.	
References	<ul style="list-style-type: none"> ✓ Shreve Chemical Process Industries, 5ed., George.T. Austin. MacGraw Hill, Book Agency ✓ Reigel's Industrial Chemistry, Ed. By James A. Kent ✓ Unit Process in Organic Synthesis by D.H. Groggins ✓ An Introduction to Industrial Chemistry, by Peter Wiseman, Applied Science Pub. Ltd. London. ✓ Industrial Chemistry by B.K.Sharma, Goel Pub ✓ Quantitative Analysis by R.A.Day & AL Underwood, 6th ed. Pub. Prentice Hall of India Ltd. ✓ Vogel's Text Book Inorganic Quantitative Analysis, 6th ed. 	
Course Outcomes	<ul style="list-style-type: none"> ✓ CO-1: understand pulp and paper industry, type of pulp, manufacture of chemical pulp and mechanical pulp. ✓ CO-2: study manufacture of paper (conversion of pulp into paper, beating process, importance of fillings, sizing, colouring materials in manufacture of paper and calendaring). ✓ CO-3: study extraction of juice, purification of juice, concentration and crystallisation of purified juice, refining of sugar. ✓ CO-4: define insecticide type of insecticides, inorganic, organic, synthetic and natural insecticides, manufacture and uses of various type of compound like eldrin, dieldrin, BHC, TEPP. ✓ CO-5: study manufacture and uses of various compounds like methanol from synthesis gas, isopropanol from propylene, acetone from isopropanol, formaldehy 	

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
CO1	Y				Y	Y							Y			K ₁
CO2										Y						K ₂
CO3				Y												K ₃
CO4					Y	Y		Y					Y			K ₄
CO5															Y	K ₅ , K ₆

High-3 Medium-2 Low-1

K₁ => Remember K₂ => Understand K₃ => Apply K₄ => Analyze K₅ => Evaluate K₆ => Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs : B.Sc. Chemistry-VI						
Course Name	Analytical Chemistry		Course Code	1091605		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To Study get introduction to chemical and instrumental Analysis, advantages and disadvantages, Overview of methods used in Quantitative analysis in different physical state. ✓ To Study factors affecting solubility of precipitates, the precipitation process, nucleation growth, Von Weimarn's theory of relative super saturation. digestion of precipitates. ✓ To Undersatnd Factors affecting quality of precipitate. ✓ To study construction of titration curves for titration . 					
Course Content	Unit I: Gas Chromatography					8 hours
	Classification of chromatography, Principles of GC separation. Components of GC, Sample introduction system, Columns: Packed column Capillary Column (WCOT, SCOT), Carrier gas and its selection-stationary phases: Solid adsorbents, Inert supports (Selection criteria, Diatomaceous earths) and liquid stationary phases, Detectors: FID, TCD, Qualitative and quantitative analysis using GC.					
	Unit II: Liquid Chromatography					7 hours
	Limitation of conventional liquid chromatography (no detail method), technique of HPLC, elementary idea about technique and layout diagrams of instrument, components of instrument of HPLC technique, Elementary idea of TLC.					

	<p>Unit III:Spectroscopy</p> <p>Types of spectrum, Process involved in interaction with matter (Fluorescence, Phosphorescence), Components of Spectrophotometer- Sources, Grating and Prism as dispersing device, Sample handling, Detectors- Photo tube, Photomultiplier tube. Block diagram and working of single beam and double beam spectrophotometer. Terms involved in Beer's law (no derivation). Causes of deviation from Beer's law. Analysis of unknown by calibration curves method, standard addition method, and ratio method. Determination of Cu^{+2}, Fe^{+3}, NO_2, using spectrophotometer. (Only principles - no detailed method), Problems based on quantitative analysis.</p>	8 hours
	<p>Unit IV:Redox& Precipitation Titration</p> <p>Precipitation Titrations Titrations involving silver salts, Detection of end points by Mohr's method, Volhard's method, Adsorption indicators. Construction of titration curves, Problems.</p> <p>Redox Titrations Formal Potential, Redox reaction: $\text{FeSO}_4\text{-KMnO}_4$, $\text{Fe}^{+2}\text{-Ce}^{+4}$, Principle of redox indicators, Structural chemistry of indicators (Diphenyl amine, Ferroin), Construction of titration curves for titration of Fe^{2+} with Ce^{4+}. Calculation of equilibrium constants for redox system, Types of indicators, Theory of true Redox indicators (Numerical). Oxidants- KMnO_4, $\text{K}_2\text{Cr}_2\text{O}_7$. Reductants-Sodium thiosulphate, Sodium arsenite.</p>	7 hours
<p>Teaching Methodology</p>	<p>Classwork, Discussion, Self-Study, Seminars and/or Assignment.</p>	
<p>References</p>	<ul style="list-style-type: none"> ✓ Quantitative Analysis by R. A. Day & A. L. Underwood, 6th ed. Pub. Prentice Hall of India ltd. ✓ Vogel's Text Book Inorganic Quantitative Analysis, 6th ed. ✓ Analytical Chemistry (Principles & Technique) by Lary G. Hargis ✓ Fundamental of Analytical Chemistry by Skoog D. A. & West D. M. ✓ Instrumental Methods of Analysis by B. K. Sharma ✓ Instrumental analysis by R.D.Braun Mc Graw Hill ✓ Analytical Chemistry by Gary Christian ✓ Analytical Chemistry by Day and Underwood ✓ Modern Analytical Chemistry by David Harvey, McGraw Hill Higher Education ✓ College Analytical Chemistry, Mangaonkar, Teckchandani, Sathe, Ghalsasi, Jain, Himalaya Publishing House ✓ Analytical Chemistry by Alka L. Gupta, PragatiPrakashan ✓ Instrumental Methods of Chemical Analysis by H. Kaur, PragatiPrakashan 	
<p>Course Outcomes</p>	<ul style="list-style-type: none"> ✓ CO-1: explain components of spectrophotometer –sources, grating and prism as dispersing device, sample handling, detectors – photo tub e, photomultiplier tube, block diagram and working of single beam and double beam spectro-photometer, terms involved in beer's law, causes of deviation from beer's law, analysis of unknown by calibration curves method, standard addition method, and ratio method, determination of Cu^{+2}, Fe^{+3}, NO_2^{-1} using spectrophotometer, problems based on quantitative analysis. ✓ CO-2: Discuss classification of chromatography. Principles of GC separation. Components of GC, Sample introduction system, Columns: 	

Packed column Capillary Column (WCOT, SCOT), Carrier gas and its selection - stationary phases: solid adsorbents, inert supports (selection criteria, diatomaceous earths,) and liquid stationary phases, detectors: FID, TCD. Qualitative and quantitative analysis using GC.

- ✓ **CO-3:** know the limitation of conventional liquid chromatography, technique of HPLC, elementary idea about technique and layout diagrams of instrument, components of instrument of HPLC technique, elementary idea of TLC.
- ✓ **CO-4:** study titrations involving Silver salts, detection of end points by Mohr's method, Volhard's method, adsorption indicators, construction of titration curves
- ✓ **CO-5:** study construction of titration curves for titration of Fe^{+2} and Ce^{+4} , explain types of indicator and theory of redox indicator, know about oxidants – KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, reductants – sodium thiosulphate, sodium arsenite and problems.

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	Knowledge Levels (K_1, K_2, \dots, K_6)
CO1	Y	Y					Y								Y	K_1, K_2
CO2		Y					Y									K_3
CO3		Y								Y		Y				K_4
CO4		Y										Y				K_5
CO5	Y	Y	Y									Y			Y	K_6

High-3 Medium-2 Low-1

$K_1 \Rightarrow$ Remember $K_2 \Rightarrow$ Understand $K_3 \Rightarrow$ Apply $K_4 \Rightarrow$ Analyze $K_5 \Rightarrow$ Evaluate $K_6 \Rightarrow$ Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs: B.Sc. Chemistry-VI						
Course Name	General Chemistry		Course Code	1091606		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To study different types of pollutions. ✓ To study nano-particles, properties of nano-particles and applications of nano particles. ✓ To study Nuclear Magnetic Resonance Spectroscopy–Proton Magnetic Resonance Spectroscopy. 					
Course Content	Unit I: NMR Spectroscopy Nuclear Magnetic Resonance Spectroscopy-Proton Magnetic Resonance Spectroscopy-Nuclear Shielding and Deshielding-Chemical Shift and Molecule Structure, Spin-Spin splitting and Coupling constants-Intensities of signals-Interpretation of NMR Spectra of simple organic molecule such as Ethyl bromide, Acetaldehyde, 1,1,2-tribromoethane, Ethylacetate, Toluene, Acetophenone, Nitrobenzene, Cyclopropane, Isomers of Pentane, Hexane and Dibromo propane.					10 hours
	Unit II: Nanoparticles Introduction of nano particles, properties of nano particles, Semiconductors, Ceramic nano particles, Catalytic aspects of nano particles, Carbon nano tubes, Applications of nano particles.					7 hours
	Unit III: Types of Pollution Introduction, types of Pollutions(1) Gaseous pollution in air, Acid rain, Green house Effect and ozone depletion(2) Radiation pollution cause, effect and control,(3) Noise Pollution and their effect and control (4) Oil pollution and their control.					8 hours

	<p>Unit IV: Chemistry in Consumer Protection</p> <p>Define Adulteration; Reasons of Adulteration, Types of Adulterants, Discussion, Methods for detection of different adulterants in some common food items:</p> <p>(1) Milk (2) Milk products: Sweet curd, Rabdi, Khoa & its product, Chhana or Paneer, Ghee, Cottage cheese, condensed milk, Khoa, Ghee, Butter (3) Oil and Fats, Mustard oil, Edible oil, Coconut oil (4) Sweetening agents : Sugar, Pithi sugar, Honey, Jaggery, Burasugar (5) Food grain and their product: (Wheat, Rice, Maize, Jowar, Bajra, Chhana and Barley etc.), Maida, Wheat flour, Besan, Suji (Rawa) and Spilt, pulses (6) Spices: Whole spices, Black Pepper, Cloves, Mustard seed and Powdered spices .</p>	5 hours
Teaching Methodology	Classwork, Discussion, Self-Study, Seminars and/or Assignment.	
References	<ul style="list-style-type: none"> ✓ Quantitative analysis by R. A. Day and A. L. Underwood ✓ Elements of Analytical Chemistry by R. Gopalan; P. S. Subramanian and K. Rengarajan ✓ Elementary Organic Spectroscopy by Y. L. Sharma ✓ Organic Spectroscopy by B. K. Sharma ✓ Environmental Chemistry by H. Kaur ✓ http://www.fssi.gov.in/Portals/0/pdf/Final-test-manual-part-II ✓ Vogel's qualitative Inorganic analysis ✓ Vogel's qualitative Organic analysis 	
Course Outcomes	<p>CO-1 : understand different types of adulteration, techniques of adulteration, methods of detection of different adulterants in some common food items like milk, milk products, oil and fats, food grains and their products, spices and miscellaneous product , hazardous effect of adulteration of human, consumer's rights and some legal procedures</p> <p>CO-2: study nano-particles, properties of nano-particles, semiconductors, ceramic nanoparticles, catalytic aspects of nano-particles, carbon nano-tubes, applications of nano particles</p> <p>CO-3: study different types of pollutions such as: (1) gaseous pollution in air, acid rain, green house effect and ozone depletion, (2) radiation pollution cause, effect and control, (3) noise pollution and their effect and control, (4) oil pollution and their control</p> <p>CO-4: study Nuclear Magnetic Resonance Spectroscopy–Proton Magnetic Resonance (¹H NMR) Spectroscopy - nuclear shielding and deshielding – chemical shift and molecule structure, spin-spin splitting and coupling constants – areas of signals – interpretation of NMR spectra of simple organic molecule such as ethyl bromide, acetaldehyde, 1,1,2-tribromoethane, ethylacetate, toluene, acetophenone, nitrobenzene, cyclopropane, isomers of pentane and hexane.</p>	

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
CO1		Y		Y			Y	Y						Y		K1
CO2				Y												K2,K3
CO3					Y							Y				K4
CO4							Y			Y					Y	K5,K6

High-3 Medium-2 Low-1

K₁ =>Remember K₂ =>Understand K₃ =>Apply K₄ =>Analyze K₅ =>Evaluate K₆ =>Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science		Department Name: Chemistry			
Recommended Programs : B.Sc. Chemistry-VI					
Course Name	Chemistry Practicals		Course Code	1093607	
Credit Hours	L	T	P	N	Total Credits
		2			
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)				
Effective From	June 2024				
Prerequisites (if any)	Basic Science				
Course Objectives	<ul style="list-style-type: none"> ✓ To provide students with practical skills and knowledge in performing volumetric analysis, including the principles , techniques and calculations involved in accurate titrations. ✓ To study angle of rotation as well as specific rotation of optically polar substances using polarimeter. ✓ To undersatnd develop laboratory skills for the purpose handling different instruments, interpretation of results of experiments and their correlation with theory. ✓ To get training in the quantitative analysis using gravimetric method. ✓ To study develop skills required for the qualitative analysis of organic mixture. 				
Course Content	<p>ORGANIC SEPARATION (Any 06)</p> <p>Separation of binary mixture, identification of the components and its crystallization & preparation of one derivative and its purification:</p> <p>ACID : Benzoic acid, Salicylic acid,Phthalic acid,Cinnamicacid, Phenyl aceticacid</p> <p>BASE : o–Nitroaniline, m–Nitroaniline, p–Nitroaniline, Aniline, p–Toluidine,p– Chloroaniline, Dimethylaniline, Diethylaniline, Diphenylamine.</p> <p>PHENOL : Phenol, Alpha naphthol, Beta naphthol, O- Nitro Phenol</p> <p>NEUTRAL ALDEHYDE : Benzaldehyde</p> <p>KETONE : Acetone, Methyl Ethyl ketone, Acetophenone</p> <p>ESTER : Methyl acetate, Ethylacetate,</p> <p>ALCOHOL : Methanol, Ethanol</p> <p>HYDROCARBON : p-Xylene, Toluene, Anthracene, Naphthalene, Diphenyl</p> <p>NITRO HYDROCARBON : Nitro benzene, m–Dinitro benzene</p> <p>HALOGENATED HYDROCARBON :</p>				20 hours

	Chloroform, Carbontetrachloride, Chlorobenzene, Bromobenzene, p-Dichlorobenzene AMIDE : Benzamide ANILIDE : Acetanilide	
	GRAVIMETRIC ESTIMATION (Any 03) 1. Fe ⁺² as Fe ₂ O ₃ from Fe·NH ₄ -SO ₄ + CuSO ₄ 2. Ba ⁺² as BaSO ₄ from BaCl ₂ + FeCl ₃ 3. Al ⁺³ as Al ₂ O ₃ from Al ₂ (SO ₄) ₃ + CuSO ₄ ESTIMATION OF ALLOY 1. Brass - Zinc as Zn ₂ P ₂ O ₇ gravimetrically & Copper by iodometrically(volumetric) 2. German silver - Nickel as Ni (DMG) ₂ gravimetrically & Copper by iodometrically	10 hours
	VOLUMETRIC EXERCISE (Any 03) 1. To determine the percentage purity of potassium acid phthalate. 2. To determine the amount of Ammonium sulphate in the given solution. 3. To determine the amount of Bismuth by EDTA. 4. To determine the amount of Ferric by EDTA. 5. To determine the amount of Chromium by EDTA. 6. To determine the amount of Nickel with Magnesium by EDTA. 7. To determine the amount of Chloride by Mohr's method OR Absorption indicator. 8. To determine the amount of Bromide by Vohlard's method OR Absorption indicator. 9. To determine the percentage purity of NaNO ₂ / KNO ₂ .	10 hours
	PHYSICAL EXERCISE (Any 04) 1. To investigate rate of reaction between KBrO ₃ and KI, a = b 2. To investigate rate of reaction between KBrO ₃ and KI, a ≠ b 3. Surface Tension: To compare the cleansing power of two detergents by measuring surface tension of their solutions. 4. pH metry: To determine the dissociation constant of weak acid by titration of weak acid and strong base. 6. Colourimetry: To determine the indicator constant of Phenolphthalein. 7. Colourimetry: To verify Beer's law for KMnO ₄ solution. 8. Potentiometry: To determine the solubility and solubility product of sparingly soluble salt AgCl by the titration of AgNO ₃ and NaCl.	20 hours
Teaching Methodology	Classwork, Discussion, Self-Study, Seminars and/or Assignment.	
References	<ul style="list-style-type: none"> ✓ Elements of physical chemistry by Glasstone and Lewis ✓ Physical chemistry by G.M. Barrow ✓ Physical chemistry by W. Moore ✓ Organic Chemistry by Morrison and Boyd. ✓ Organic reaction mechanism by Bansal Tata Mac. Hill 	

	<ul style="list-style-type: none"> ✓ Organic Chemistry (Vol I & II) 6 th Edn, I. L. Finar ✓ Basic Principles of Organic chemistry, by R. Y. Caserio, W. A. Benjamin ✓ Vogel's text book inorganic Quantitative analysis, 6th ed. ✓ Vogel's qualitative inorganic analysis. ✓ Vogel's qualitative organic analysis.
Course Outcomes	<p>CO-1: study and justify kinetics of 2nd order reactions practically.</p> <p>CO-2: determine quantity of active ingredient in commercial product [Vanila] using conductometric principles and conductometric titration.</p> <p>CO-3: determine degree of dissociation and dissociation constant of weak monobasic acid by titration method using pH metry.</p> <p>CO-4: verify Lambert-Beer law for colored solution using colorimeter/ spectro-photometer.</p> <p>CO-5: determine normality and amount of given acid in mixture using conductivity meter.</p> <p>CO-6: maintain records of chemical and instrumental analysis, develop laboratory skills for the purpose of collecting, interpreting, analyzing, practical data.</p> <p>CO-7: develop laboratory skills for the purpose handling different instruments, interpret of results of experiments and their correlation with theory.</p> <p>CO-8: get knowledge of Systematic qualitative analysis of Inorganic mixtures.</p>

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
C01		Y							Y							K1
C02		Y							Y							K2
C03		Y									Y				Y	K3
C04		Y									Y				Y	K4
C05		Y							Y							K2
C06		Y													Y	K4
C07		Y														K5
C08		Y								Y					Y	K6

High-3 Medium-2 Low-1

K₁ =>Remember K₂ =>Understand K₃ =>Apply K₄ =>Analyze K₅ =>Evaluate K₆ =>Create

VIDHYADEEP UNIVERSITY

Anita

Institute Name: Vidhyadeep Institute of Science			Department Name: Chemistry			
Recommended Programs: B.Sc. Chemistry- VI						
Course Name	Petrochemicals		Course Code	1093608		
Credit Hours	L	T	P	N	Total Credits	2
		2				
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)					
Effective From	June 2024					
Prerequisites (if any)	Basic Science					
Course Objectives	<ul style="list-style-type: none"> ✓ To understand petrochemicals obtained from C3-cut of petroleum, manufacture and industrial applications of chemicals obtained from propylene. ✓ To study general account of petrochemicals used as monomers in the manufacture of polyester fibers, manufacture of DMT, terephthalic acid, phthalic anhydride, maleic anhydride, 1:4 butanediol and other monomers like penta erithritol and di-isocyanates. ✓ To study chemicals obtained from C4 and C5 cut of petroleum, manufacture and industrial applications. 					
Course Content	Unit I: Petrochemicals obtained from C3-cut of petroleum Manufacture and industrial applications of chemicals obtained from Propylene: Isopropyl alcohol, Acetone (Wacker-Chemieprocess), Propyleneoxide (Halcon process), Acrylonitrile, Glycerol and Isoprene, Propylene tetramer, Acrylic acid, N-Butyraldehyde (Oxoprocess), Methyl isobutyl ketone, Methylmethacrylate.					8 hours
	Unit II: BTX aromatic Recovery process of BTX, manufacture and industrial applications of benzene, toluene, xylene, naphthalene, phenol, styrene.					7 hours

	<p>Unit III: The method for the large scale production with flow diagram and uses of:</p> <p>(i) Acetoacetanilide (ii) Anthraquinone (iii) β-naphthol from naphthalene (iv) Benzoic acid (v) Aspirin (vi) Chloramphenicol (vii) Paracetamol (viii) p-Aminophenol.</p>	8 hours
	<p>Unit IV: Chemicals obtained from C4 & C5 cut of petroleum</p> <p>Manufacture and industrial applications of Butadiene, Butylalcohols, Methylterbutyl ether (MTBE), Cyclopentadiene, Sulpholane.</p>	7 hours
<p>Teaching Methodology</p>	<p>Classwork, Discussion, Self-Study, Seminars and/or Assignment.</p>	
<p>References</p>	<ul style="list-style-type: none"> ✓ Introduction to petrochemicals by Sukumar Maiti, Oxford and IBH Pubs Co. New Delhi ✓ A text on petrochemicals by Dr. B.K. Bhaskar Rao, Khanna Pubs. New Delhi ✓ Chemicals from petroleum by A.L. Wadams (ELBS and John Murray London) ✓ Petrochemicals by S.L. Venkateswari (Colour Pubs. Pvt. Ltd. Bombay) ✓ Petrochemicals digest by MGK Manon (Asia Publishing House Bombay) ✓ Hand book of industrial chemicals Vol-I by K. M. Shah (Multi tech publishing co. 15 Yogesh, Hingwala lane, Ghatkoper (E) Bombay-400077) ✓ Industrial chemistry including chemical engineering by B.K. Sharma, Goel Pubs. House, Meerut. ✓ Hand Book of Synthetic Dyes and Pigments (Vol. II) By K.M. Shah, Multi-tech Publishing Co. 	
<p>Course Outcomes</p>	<p>CO-1: petrochemicals obtained from C3-cut of petroleum, manufacture and industrial applications of chemicals obtained from propylene: iso propyl alcohol, acetone, propylene oxide, acrylonitrile, glycerol and isoprene, propylene tetramer, acrylic acid, n-butyraldehyde, methyl isobutyl ketone, acrolein, acrylamide, methyl methacrylate</p> <p>CO-2: have general account of petrochemicals used as monomers in the manufacture of polyester fibers, manufacture of DMT, terephthalic acid, phthalic anhydride, maleic anhydride, 1:4 butanediol and other monomers like penta erithritol and di-isocyanates</p> <p>CO-3: define insecticides, classification of insecticides on basis of mode of action. Synthesis of Methoxychlor, Captan, Parathion, Malathion and Perthane</p> <p>CO-4: study chemicals obtained from C4 and C5 cut of petroleum, manufacture and industrial applications of butadiene, butylalcohols, methyl terbutyl ether (MTBE) cyclopentadiene, sulpholane</p> <p>CO-5: study recovery process of BTX, manufacture and industrial applications of benzene, toluene, xylene, naphthalene, phenol, styrene, aniline, maleic anhydride, cyclohexanol</p>	

Mapping of Course outcome with Program Outcomes, PSO's, and Knowledge Levels (As per Blooms Taxonomy)

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO 7	PSO 8	Knowledge Levels (K ₁ , K ₂ , ..., K ₆)
CO1		Y								Y						K1
CO2				Y						Y						K2,K3
CO3						Y							Y		Y	K4
CO4													Y		Y	K5
CO5			Y													K6

High-3 Medium-2 Low-1

K₁ =>Remember K₂ =>Understand K₃ =>Apply K₄ =>Analyze K₅ =>Evaluate K₆ =>Create