

Department of Chemistry

B.Sc. Programme

Vision

The Department of Chemistry aspires to be among the top in the nation by preparing the students in such a way that they are self-reliant, highly informed and a better choice in the demanding and ever-changing world.

Mission

The teaching of Chemistry aims to: gear the students to be liberative, transformative and empowering the Learner and the Learned (Teacher).

Program Educational Objectives:

The graduates of B.Sc. Chemistry are expected to attain the following PEOs within five to seven years of their graduation. The main objectives of the programme are

PEO1	To prepare the students to have in depth knowledge and skills in the core areas of chemical science
PEO2	To develop the students to have multi-disciplinary subject knowledge both in the diverse fields of chemical science such as analytical chemistry, pharmaceutical chemistry, leather chemistry and also its allied subjects like mathematics, physics and biology
PEO3	To provide knowledge and skills in the frontier areas of chemical research
PEO4	To develop critical thinking, problem solving ability and analytical reasoning in solving the problems pertaining to the environment, sustainable development, their chosen career and higher studies
PEO5	To develop professional, practical, leadership and entrepreneurial skills in their chosen field and practice it with moral and ethical virtues

Program Outcomes:

PO1	<i>Ethics and social responsibilities</i> Commitment to sustainability and rich ethical standards in social and professional practices
PO2	<i>Communicative and writing skills</i> Understand the language usage with development of communicative and written skills
PO3	<i>Inter and trans disciplinary development</i> Understand principles and theories of organic, inorganic, physical, analytical, pharmaceutical, leather and environmental chemistry with cross cutting approach
PO4	<i>Problem solving analysis</i> Solve complex scientific problems by conducting scientific derivation or chemical analysis
PO5	<i>Individual and team work</i> Function effectively as member or leaders in diverse teams, and in multi-disciplinary environment
PO6	<i>Chemicals and tools usage</i> Acquire skills pertaining to safe handling of chemicals, apparatus, instruments and modern tools with proper functionality
PO7	<i>Disciplinary knowledge development</i> Apply possessed knowledge of fundamentals in chemistry to solve associated problems
PO8	<i>Professional skill development</i> To impart professional skill sets in chemistry and meet out the current chemical industries needs

Program Specific Outcomes:

PSO - 01	<i>Life long learning</i> Develop the practices of lifelong learning in laboratory, analytical/pharmaceutical/leather chemistry skills and interpret knowledge in the working environment
PSO - 02	<i>Education and Employment</i> Ability to pursue higher studies of specialization and take of employment in analytical/pharmaceutical/leather industry



2021 - BATCH

V & VI - SEMESTERS

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY507			Title	Batch:	2021 – 2024
				Core Paper- V	Semester:	V
Lecture Hrs./Week	4	Tutorials/ Sem	1	Coordination and Bioinorganic Chemistry	Credits:	4

Course Objective

To impart essential knowledge regarding the terminologies, theories of coordination chemistry, bonding, structure and stereochemistry of coordination compounds and Bioinorganic chemistry to succeed a chemistry graduate program.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Reminisce the important terms in coordination chemistry	K1
CO2	Understand different theories of coordination compounds	K2
CO3	Apply the theories of bonding in coordination complexes	K3
CO4	Predict the reaction mechanisms in coordination complexes and Determine the stability constant by Job's and Bjerrum's method	K4 & K5
CO5	Acquire knowledge in Bioinorganic chemistry and metal carbonyls	K4

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	M	H	-	-
CO2	M	H	H	M	M	M	M	M	-	-
CO3	H	M	L	M	H	M	M	M	-	-
CO4	M	H	M	H	H	M	L	H	-	-
CO5	H	H	M	M	H	M	M	H	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Introduction to coordination chemistry: Double salts- complex compounds- complex ion and coordination number- Ligands and their classification -coordination number- IUPAC Nomenclature of coordination compounds. Chelates-Factors affecting the stability of chelate complexes and their uses. Isomerism in Co-ordination compounds: Structural and Stereo isomerism- Geometrical and Optical isomerism in square planar and octahedral complexes.	12
Unit II	Theories of coordination compounds: Werner's theory- Sidwick's electronic interpretation- EAN concept- valence bond theory- outer and inner orbital complexes- Limitations of VBT- crystal field theory- Crystal field splitting in octahedral, tetragonal, square planar and tetrahedral complexes- High spin and Low spin complexes.	12
Unit III	Theories of coordination compounds: Factors affecting crystal field splitting, John Teller distortion- Crystal field stabilization energy- calculation and uses- Limitations of crystal field theory. Applications of coordination compounds: Applications of copper and silver complexes in qualitative analysis. Applications of Ca-EDTA and Ni-DMG complexes in quantitative analysis.	12
Unit IV	Properties of complexes: Color of transition metal complexes-visible spectrum of aqueous Ti (III) ion. Stability of complexes-overall and stepwise formation constants. Factors affecting stability-Determination of stability constant by Job's and Bjerum's method.	12

	Reaction Mechanism in Complexes: Ligands substitution in octahedral complexes: Inert and Labile complexes Nucleophilic ligands substitution reactions, SN1 and SN2 mechanisms. Substitution reactions without breaking Metal-Ligand bond. Trans effect in square planar complexes: Definition, trans effect series and uses of trans effect.	
Unit V	Bioinorganic chemistry: Metals in biology-bulk and trace metals- Structure and function of Metalloporphyrins-Chlorophyll- Vitamin B12- Structure and Biological role of Myoglobin and hemoglobin. Metallo enzymes- carboxy peptidase and peroxidase-sodium and potassium ion pump. Biological functions and toxicity of chromium, manganese, cobalt, nickel, copper, arsenic, iodine and mercury. Metal Carbonyls : Mono and Binuclear carbonyls - $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Co}_2(\text{CO})_8$ and $\text{Cr}(\text{CO})_6$ - synthesis, properties, structure and EAN.	12
	Total Contact Hrs	60

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Kalsi.P.S.,Kalsi.J.P., AshuChaudhary	Bioinorganic Chemistry and Supramolecular Chemistry	New Age International Pvt., Ltd.	2020
2	Soni. P.L	Text book of Inorganic Chemistry	20 th revised Edition. Sultan Chand & Sons	2017
3	Madan, Malik and Tuli.	Selected Topics in Inorganic Chemistry.	Sultan Chand & Sons	2010

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Puri and Sharma and Kalia. K.C.,	Principles of Inorganic Chemistry	33 rd Edition. Milestone Publishers and Distributors	2016
2	Gopalan. R. and RamalingamV	Concise Coordination Chemistry.	Vikas Publishing house. 3 rd Edition	2008
3	Lee. J.D	Concise Inorganic Chemistry	5 th Edition. London: Black Well Science Ltd	2006

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. M. Amutha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY508			Title	Batch:	2021 – 2024
				Core - VI	Semester:	V
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	1	Organic Chemistry – I	Credits:	4

Course Objective

To make the students to understand the mechanisms of molecular rearrangements, to acquire knowledge on heterocyclic compounds, carbohydrate chemistry and structural elucidation of natural products.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect and interpret the mechanisms of molecular rearrangements	K1, K4
CO2	Understand the significance of heterocyclic compounds	K2
CO3	Understand the importance of carbohydrate chemistry	K2
CO4	Apply and interpret various chemical methods in deducing the structures of alkaloids	K3,K4
CO5	Apply and deduce the structure of terpenoids	K3,K4

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	M	H	H	H	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H	H
CO3	H	M	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	H	H	M	H
CO5	H	M	H	H	H	H	H	H	M	H

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Molecular Rearrangements: Pinacol Pinacolone, Beckmann, Hoffmann, Curtius, Schmidt, Lossen, Benzidine, Benzilic acid, Fries, Baeyer Villiger, Cope and Claisen rearrangements.	12
Unit II	Heterocyclic Compounds: Chemistry of Furan, Pyrrole, Thiophene, Pyridine, Quinoline, Isoquinoline and Indole. Pyrazole - Preparation and properties. Reagents in organic synthesis: Ozone, Osmium tetroxide, Lithium Aluminium hydride, sodium borohydride and Birch reduction.	12
Unit III	Carbohydrates: Classification, configuration of Monosaccharides, chemistry and structural elucidation of Glucose and Fructose, interconversion in sugar series [Glucose to Fructose and vice versa, Glucose to Arabinose and vice versa], Mutarotation and epimerization. Analysis of carbohydrates. Sucrose, Maltose and Lactose – Preparation, Properties and uses [Structural elucidation is not required]. Introduction to Polysaccharides: Starch and cellulose (Structural determination is not required)	12
Unit IV	Alkaloids: Definition, occurrence and extraction of alkaloids from plants. General methods of determining structure. Determination of structure of Coniine, Piperine, Papaverine and Nicotine.	12
Unit V	Terpenoids: Classification, isoprene rule, special isoprene rule and Gemdialkyl rule, Extraction from plants, structural elucidation of Citral, Camphor, α - terpineol and Menthol.	12
	Total Contact Hrs	60

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Finar, I.L.	Organic Chemistry- Volume II.	Pearson Education, 5 th edn,	2011
2.	Arun, B and Bahl, B.S.	Advanced Organic Chemistry	S. Chand & Co. 5 th edn.	2012
3.	Soni, P.L.	Textbook of Organic Chemistry	S. Chand & Co.	2012

Reference Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Gurtu, J.N. and Kapoor, R.	Organic Reactions and Reagents	S.Chand& Co.	1998
2.	Agarwal, O.P.	Organic Chemistry-Natural Products Vol.I.	Meerut:Goel Publishing House. 42 nd edn.	2013
3.	Agarwal, O.P.	Organic Chemistry-Natural Products Vol.II.	Meerut:Goel Publishing House. 41 st edn.	2014
4.	Bansal, R. K.	Heterocyclic Chemistry: Syntheses, Reactions and Mechanisms.	New Age International Publishers. 3 rd edn.	1999

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
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Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. Indumathy Ramasamy 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY509			Title	Batch:	2021 – 2024
				Core Paper – VII Electro Chemistry	Semester:	V
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	1		Credits:	4

Course Objective

To learn about the theories of conductance, basic principles and applications of electrochemical cells and apply electro chemical principles to fuel cells, batteries and mechanism of corrosion.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Discuss the theories/laws of conductance, apply the theories of electrolytes	K2, K3
CO2	Construct the electrochemical cell and apply the electrolytic cell reaction to calculate enthalpy, entropy and free energy	K4, K3
CO3	Analyze the types of solutions based on pH and predict suitable indicators for the volumetric titrations	K4, K2
CO4	Appraise the pH, valency, equilibrium constant for a given electrolyte	K4
CO5	Discuss the types of batteries, fuel cells, theories of corrosion & its mechanism	K5

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	H	M	-	-
CO2	H	H	H	M	M	M	H	M	-	-

CO3	H	H	H	M	M	M	H	H	-	-
CO4	H	H	H	M	M	M	H	H	-	-
CO5	H	H	H	M	M	M	H	H	-	-

High – H, Medium – M, Low – L

Units	Content	Hrs
Unit I	Conductivity of Ions: Electrolytic Conduction and Electrolysis - Faradays Laws of electrolysis. Measurement of conductivity in electrolytic solution. Variation of specific and equivalent conductances with dilution. Ionic mobility, Discharge of ions on electrolysis. Transport Number: Definition, Determination by the Hittorf's method and the Moving Boundary Method. Arrhenius theory of electrolytic dissociation and the Ostwald's dilution law. Kohlrausch's law of independent migration of ions and its applications. Debye -Huckel theory of strong electrolytes. Debye Huckel Onsager equation for the equivalent conductivity of strong electrolytes (Derivation not required), Wein and Debye Falkenhagen effects.	12
Unit II	Applications of conductance measurements: Determination of degree of dissociation of weak electrolytes, determination of ionic product of water, determination of solubility and solubility product of sparingly soluble salts and conductometric titrations. Electrochemical cells I: Nernst Equation, EMF of a cell and it's measurement. Thermodynamic quantities of cell reactions: ΔH, ΔS and ΔG from EMF data. Reversible electrodes and their types: Metal - Metal ion, Metal - insoluble salt, Gas - ion and redox electrodes. Single electrode potentials, standard electrode potentials, electrochemical series, computation of standard EMF and writing cell reactions.	12
Unit III	Electrodes for the measurement of pH: Hydrogen gas electrode, Quinhydrone electrode and glass electrode. pH scale, Common ion effect. Buffer solution: Buffer action, Henderson's equation and the evaluation of the dissociation constant. Acid-Base Indicators: Theories of Acid-Base Indicators. Acid-Base Titrations. Hydrolysis of Salts: Degree of hydrolysis, Relationship between K_h, K_w and dissociation constant for salts such as sodium acetate, ammonium chloride and ammonium acetate. Determination of Degree of hydrolysis- indirect method and	12

	Electrical Conductance method.	
Unit IV	Electrochemical cells II: Concentration cells with and without transference. Liquid junction potential - Formation and elimination. Applications of EMF measurements: Determination of Activity Coefficients of Electrolytes, Calculation of valency of ions in doubtful cases ($\text{Hg}^+/\text{Hg}^{2+}$), determination of solubility of sparingly soluble salts. Electrochemical instrumentation and techniques: Potentiostatic and galvanostatic experiments. Cyclic voltammetry, chronoamperometry, chronopotentiometry.	12
Unit V	Batteries: Dry Cell, Lead-Acid storage cell and Nickel- Cadmium, Nickel- Zinc accumulator. Fuel Cell: Hydrogen - Oxygen fuel cell, Hydrogen - Oxygen fuel cell in manned space flights. Hydrogen over voltage: Measurement and its application to metal deposition. Electrochemical corrosion: Mechanism, Galvanic and differential aeration corrosion. Prevention of corrosion: Proper designing, using pure metal, using metal alloys, and uses of inhibitor (Brief account only). Metallic coatings: Anodic and cathodic coatings. Method of application of metallic coatings: Hot dipping and electro plating (Nickel and chromium plating).	12
	Total Contact Hrs	60

Pedagogy

Instruction, Digital Presentation, Flipped Class

Assessment Methods

Test, Seminar, Quiz, Assignments, Group Task.

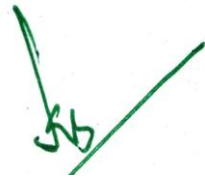
Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION

1	Soni. P.L., and Dharmarha. O.P. & Dash U.N.	Text book of Physical Chemistry	Sultan Chand & Sons	2016
2	Puri. B.R., Sharma L.R., Pathania M.S.	Principles of Physical Chemistry	44 th Edn. Vishal Publishing Company	2010
3	Jain. P.C. and Monica Jain.	Engineering Chemistry, 17th Edition	Dhanpat Rai Publishing Company(P) Ltd	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1	Glasstone S	Introduction to Electrochemistry	East-West Press (Pvt) Ltd.	2014
2	Gurdeep Raj	Advanced Physical Chemistry	35 th Edn. GOEL Publishing House	2014
3	John.O.M. Bockris & A.K.N. Reddy	Modern Electrochemistry (Vol I & II)	2 nd Edn. Plenum Publishing Corporation	2006

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. T.Gowrani 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY510			Title	Batch:	2021 – 2024
				Core Paper – VIII Dye Chemistry	Semester:	V
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	1		Credits:	4

Course Objective

To enhance the basic knowledge and improve skills on preparation and uses of various dyes and fibres to choose their career as dye chemists in dyeing and textile industry.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the classification, basic concepts, theories of colour and constitution	K1
CO2	Understand the preparation and applications of various azo and nitro dyes	K2, K4
CO3	Utilize the classification, preparation and uses of some important phenyl methane dyes	K3
CO4	Analyze the various anthraquinone dyes, organic pigments and fluorescent brightening agents	K4
CO5	Explain the preparation and properties of various types of textile fibres to dye industry and uses of non textile fibres	K2, K5

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	M	H	H	-	-
CO2	H	H	H	M	H	M	H	H	-	-

CO3	H	H	H	M	H	M	H	H	-	-
CO4	H	H	H	M	H	M	H	H	-	-
CO5	H	H	H	M	H	M	H	H	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Electromagnetic spectrum: Relationship of colour observed to wavelength of light absorbed. Complementary colours. Terms used in dye Chemistry - Chromophores, Auxochromes, Bathochromic shift, Hypsochromic shift, Hypochromic shift and Hyperchromic shift. Colour and constitution: Otto Witt's theory, Quinonoid theory and Molecular orbital theory of various transitions. Classification of dyes according to their chemical constitution and mode of applications.	12
Unit II	Azo dyes: Principles governing azo-coupling, diazotisation, mechanism of diazotization, coupling with amines and phenols, effects of substituent on diazotization. Synthesis and applications of important azo dyes: Methyl orange, Orange I, Orange II, Metanil yellow, Eriochrome black – T, Bismark brown and Congo red. Synthesis and applications of nitro dyes: Picric acid, Martius yellow and Naphthol yellow S - Nitroso dyes: Fast green O and Naphthol green Y.	12
Unit III	Synthesis, reactions and uses of Diphenyl methane dyes: Auramine O and Auramine G - Triphenyl methane dyes: Malachite green, Rosaniline, Crystal violet – Phthalein dyes: Phenolphthalein - Xanthene dyes: Eosin and Rhodamine B. Synthesis and uses of Indigoid dyes: Indigotin and Indigosol O.	12
Unit IV	Anthroquinone dyes: Anthraquinone acid dyes – Alizarin cyanine green and Solwayultra blue B. Mordant dyes - Alizarin and Alizarin Blue. Vat dyes - Vat Blue 43 (Carbazole). Disperse dyes - Disperse Red 15. Organic Pigments: Characteristics of pigments, uses of pigments. Types of Pigments – Lakes and Toners. Fluorescent brightening agents. Classification and properties. Fluorescent brighteners for a). Cellulosic fibers b). Acrylic fibers.	12

Unit V	Textile fibres: Definition – classification of textile fibres – structure, physical, chemical properties and uses of cellulose fibre (cotton), protein fibre (silk and wool). Rayon – different types of rayon and their sources - manufacture of viscose rayon. Various methods of dyeing - Direct dyeing, Mordant dyeing, Vat dyeing, Disperse dyeing. Non-textile uses of dyes in leather, paper, foods, drugs, colour photography and indicators.	12
	Total Contact Hrs	60

Pedagogy: Direct Instruction, Digital Presentation and Flipped Class

Assessment Methods: Test, Seminar, Quiz, Assignments, Group Task

Text Book

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Gurdeep, R	Synthetic dyes, 4th edn	Mumbai: Himalaya Publishing House Pvt Ltd	2016
2	Arun Bhal & Bahl, B. S.	A textbook organic chemistry, 22nd edn	New Delhi: S. Chand and Company Ltd	2016
3	Sharma, B. K.	Industrial chemistry. 14th edn	New Delhi: Goel Publishing House	2008
4	Tyagi, O. D & Yadav, M. A.	A text book of synthetic dyes, 2nd edn.	New Delhi: Anmol Publications Pvt. Ltd.	2002

Reference Book

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Rao, R. S., Shridhar, G., Mukherjee, B. & Parulekar, T.	Introduction to synthetic drugs and dyes. 13th end	Mumbai : Himalaya Publishing House Pvt Ltd.	2018
2	Pope Sine	Synthetic dye, 1st edn.	New Delhi : Rajat Publications.	2003

3	Rajbir Singh	A handbook of <i>synthetic dyes</i> , 1st edn.	<i>New Delhi:</i> Mittal Publications	2016
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Course Designed by	Head of the Department	Curriculum Development Cell	Controller of Examination
Name with Signature	Name with Signature	Name with Signature	Name with Signature
Name : Dr. M. Selladurai 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	21UCY5E1	Title	Batch :	2021–2024
		Core Elective Paper – I	Semester	V
Hrs/Week:	4	Analytical chemistry- I	Credits:	5

Course Objective

To build a basic knowledge on generation of analytical data in an appropriate manner. To expertise the instrumental methods of chemical analysis for microgram level; to cultivate the analytical skill in the structural identification of chemical compounds.

Course Outcomes

On the successful completion of the course students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Provide thorough knowledge on gravimetry.	K1, K2
CO2	Learn instrumentation and basic principles and applications of modern analytical tools such as TGA and DTA	K2, K3
CO3	Have knowledge on application of Polarimetry, Nephelometry and Turbidimetry	K2, K4
CO4	Acquire knowledge and analyze analytical tools like polarography and amperometric titrations	K3
CO5	Know the importance of chromatography	K2, K5

Mapping with PO / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	H	H	H	H
CO2	H	H	H	M	M	M	H	H	H	H
CO3	H	H	H	M	M	M	H	H	H	H

CO4	H	H	H	M	M	M	H	H	H	H
CO5	H	H	H	M	M	M	H	H	H	H

H – High; M – Medium; L – Low

Unit	Content	Hrs
Unit I	Data Analysis: Definition and terms – absolute and relative error. Precision and accuracy. Classification of errors. Sources and minimisation of errors. Significant figures. Sampling: Significance of sampling, types of sample, sampling methods for solids, liquid and gases. Gravimetric Analysis: Precipitation methods. Conditions of precipitation, co-precipitation and post precipitation. Precipitation from homogeneous solution. Washing of the precipitate. Organic precipitants – DMG, Cupron, Cupferron, oxine and salicylaldehyde.	12
Unit II	Thermogravimetric Analysis (TGA): Principle, discussion of various components with block diagram, Characteristics of TGA curve, factors affecting thermogravimetric curves. Applications: Evaluation of gravimetric precipitation, curie point determination and study of organic compounds. Differential thermal analysis (DTA): Principle, discussion of various components with block diagram, Characteristics of DTA curve, factors affecting the DTA curve. Applications: heat of reaction, specific heat and quality control. Thermometric titrations (TTA): Principle and applications.	12
Unit III	Polarimetry: Theory and instrumentation. Comparison of acid strength using polarimeter and estimation of glucose. Nephelometry and Turbidimetry: Theory, principles and applications in Inorganic analysis, turbidimetric titrations and phase titrations. Flame photometry: Theory, principle and applications in Qualitative and Quantitative analyses.	12

Unit IV	Polarography: Principle, dropping mercury electrode – advantages and disadvantages. Experimental assembly, current – voltage curves. Significance of Ilkovic equation (derivation not required). Half wave potential. Applications in qualitative and quantitative analyses.	12
	Amperometric Titrations: Principle, apparatus and technique. Dead stop endpoint method. Advantages and disadvantages of amperometric titrations.	
Unit V	Chromatographic techniques:	12
	Paper Chromatography: Principle, RF value and experimental details. Applications in qualitative and quantitative analyses.	
	Thin Layer Chromatography: Principle, brief account of experimental details and its advantages. Applications in the separation of amino acids.	
	Column Chromatography: Principle, experimental details, factors affecting the column efficiency and applications.	
	Ion Exchange Chromatography: Principle, types of resins, action of resins and applications in softening of hard water.	
	Gas liquid chromatography: types, principle, theory and applications of gas liquid chromatography.	
Total contact Hrs/Semester		60

*Italics denotes self study topics

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Khopkar S.M	Basic concepts of Analytical Chemistry.	New Age International Pvt Ltd. 4 th Edition.	2020

2	Gurdeep R Chatwal Sham K. Anand	Instrumental Methods of Chemical Analysis	Himalaya publishing House. 5th Edition.	2014
3	Arthur. I. Vogel	Inorganic Quantitative Analysis.	4 th Edition. Longmans	1978

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Usharani S	Analytical Chemistry.	Laxmi Publications, 1 st Edition.	2019
2	Douglas A. Skoog, Donald M. West and F. James Holler	Fundamentals of Analytical Chemistry.	Harcourt Asia Pvt. Ltd. 9 th Edition.	2001
3	Douglas A. Skoog, Donald M. West and F. James Holler	Analytical Chemistry, An Introduction.	Saunders College Publishers. 7 th Edition.	2000
4	Skoog D. A	Principles of Instrumental Analysis	Saunders College Publishers, 5 th Edition	1998

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms. R. Sudha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of chemistry	
Course Code:	21UCY5E2	Title	Batch:	2021 – 2024
		Core Elective – I	Semester:	V
Lecture Hrs./Week	4	Pharmaceutical Chemistry-I	Credits:	5

Course Objective

To create awareness among the students about the historical development of profession of Pharmacy, the formulation aspects of different dosage forms, and how a drug's chemical structure describe the factors that affect its absorption, distribution, metabolism, and excretion, traditional and alternative system of medicine and principles involved in limit test for impurities.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify their professional role in the healthcare system	K1
CO2	Classify different dosage forms and apply principles of pharmaceutical science in formulation and dispensing the various dosage forms	K2
CO3	Understand the concept of Pharmacology and pharmacodynamics	K3
CO4	Analyse the scope and development of Pharmacognosy	K4
CO5	Explain the types of impurities, limit test for impurities and classification of Antidotes and Antacids	K5

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	M	M	H	M	M	H	H	H
CO2	M	H	M	L	M	H	M	M	H	H
CO3	M	H	H	M	H	M	H	H	H	H

CO4	H	M	M	M	M	H	M	M	H	H
CO5	H	M	M	M	H	M	M	H	M	M

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Historical background and development of profession of Pharmacy: Pharmacy- Definition, Historical development of profession of Pharmacy –History of pharmacy profession in India, Pharmaceutical education and pharmaceutical industry in India. Career opportunities for Pharmacy professionals. Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeias.	12
Unit II	Introduction to Pharmaceutics: Pharmaceutics- Definition-Dosage forms- Definition, classification of dosage forms based on sterility and their physical nature. Development and evaluation of new drugs- Stages of drug development – Preclinical development and clinical development.	12
Unit III	Introduction to Pharmacology: Pharmacology-definition. Pharmacodynamics – Definition, Receptor and non-receptor mechanisms, Site of drug action, Dose Response relationship, Structural activity relationship. Pharmacokinetics – Definition, Mechanism of action of Drugs (Absorption, Distribution, Metabolism and Excretion of Drugs). Clearance of a drug. Theoretical Pharmacokinetics –Half life-order of kinetics and steady state plasma concentration. Drug safety and effectiveness- Factors modifying the dosage and action of drugs.	12
Unit IV	Introduction to Pharmacognosy: History, scope and development of Pharmacognosy, Source of Drugs (Biological, Marine, Mineral and plant tissue cultures as source of drugs. Traditional and Alternative system of medicine (Ayurvedha, Unani, Homeopathic, Siddha, Acupuncture and Yoga.) Collection and processing of Herbal drugs.	12
Unit V	Introduction to Pharmaceutical Chemistry: Sources & types of impurities, principles involved in limit test for chloride, sulphate, iron, arsenic, lead, heavy metals, Selected terminology in pharmaceutical chemistry, Antidotes & Antacids -Definition,	12

	Classification, Properties. Antimicrobials, Antioxidants, Astringents, Expectorant and Emetics –Definition, examples and uses.	
	Total Contact Hrs	60

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ali.M.,	Textbook Of Pharmaceutical Chemistry-I	CBS publishers and distributers Pvt.Ltd	2020
2.	Murugesh.	Text book of Pharmacognosy.	Sathya Publishers	2018
3	Mehta R.M.,	Pharmaceutics-I.	Vallabh Prakashan	2017
4	Suresh P. Vyas, Amit K. Goyal, GoutamRath.,	Handbook of Pharmaceutical dosage forms.	Vallabh Prakashan	2013

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Pathania J S.	<i>Textbook of Pharmacology For Bsc Nursing Students With Revision Booklet</i>	CBS Nursing.	2017
2	Bharath .S.,	Pharmaceutical Technology: Concepts and applications.	Pearson Education India	2013

3	Shayne Cox Gad.,	Pharmaceutical Manufacturing Handbook: Production and Process.	A John Wiley & Sons, Inc., publication	2008
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Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. M. Amutha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY5E3	Title	Batch:	2021 – 2024
		Core Elective – I	Semester:	V
Lecture Hrs./Week	4	Leather Chemistry	Credits:	5

Course Objective

To understand the basics of skins, leather and their composition, impart the principle involved in pre-tanning, structure, process of various tanning, process of dyeing leather and acquire knowledge on the water pollution by tannery industry and its effluent treatment.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Relate the basic principle involved in pre-tanning of skins and hides	K3
CO2	Have knowledge on various types of tanning and their physico-chemical properties	K2, K3
CO3	Interpret the chemistry behind the chrome tanning process	K4
CO4	Analyze the process involved in curing of hides and skin and their preservation	K1, K4
CO5	Have clear idea on sources of tannery effluents and their treatment	K2, K3

Mapping with POs / PSOs Vs COs

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO										
CO1	H	H	H	M	M	M	M	H	H	H
CO2	H	H	H	M	M	M	H	H	H	H
CO3	H	H	H	M	M	M	M	H	H	H
CO4	H	H	H	M	M	M	H	H	H	H
CO5	H	H	H	M	M	M	M	H	H	H

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Basic Principles and Leather Constituents: Introduction, chief process involved in leather manufacture - elementary knowledge of the structure and composition of hides and skins. Proteins and their characteristics, Anatomy and histology of protein constituents of leather (an elementary concept). Basic principle involved in pre-tanning such as soaking, liming, deliming, bating, pickling involved in pre-tanning such as soaking, liming, deliming, bating, pickling and depickling.	12
Unit II	Types of Natural and Synthetic Tanning: Types of tanning-vegetable and mineral tanning, Different types of vegetable tanning- materials classification and chemistry of vegetable tanning. Factors and Physio-chemical principle involved in vegetable tanning, Fixation of vegetable tanning. Synthetic tanning-their classifications, general methods of manufacture and use.	12
Unit III	Chemistry of Chrome Tanning: The preparation and chemistry of chrome tanning liquids, Olation, Oxolation and hydrolysis of chrome liquids. Effect of adding tanning agents-Role of pH in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning-chemistry of neutralization process. A brief survey of chemistry of other tanning like Al, Zr and Te salts and their relative merit in contrast with chrome tanning. Chemistry of combination of tannage involving vegetable tanning aldehydes, chrome and other mineral tanning agents.	12
Unit IV	Preservation of Hides and Skins and Leather Dyeing: Chemical methods of curing and preservation of hides and skins in acid and alkaline solution. Principles of analytical methods employed in curing, liming, deliming, bating, pickling. Analysis of vegetable tanning materials and extract. Process of dyeing leather-Use of mordants, dyeing auxiliaries such as levelling, wetting and dispersing agents-Dye fixations.	12
Unit V	Animal Wastes and Treatment Processes: Animal bye-products - their collection, handling and preservation methods (such as hair, blood, bones, glands, Keratinous materials and their utilization). Tannery effluents and treatment: Types of water pollution- physical, chemical, physiological and biological. Different types of tannery effluents and wastes-beam-house waste-liquors- tanning and finishing yard waste liquors, solid waste-	12

	origin and disposal. Non-textile uses of dyes in leather, paper, foods and drugs, colour photography and indicators.	
	Total Contact Hrs	60

Pedagogy

Instruction, Digital Presentation, Flipped Class

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Jain P.C. & Monica Jain.	Engineering Chemistry	16 th Edn. Dhanpat Rai Publishing Co., Pvt. Ltd	2016
2	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	S. Chand and Company Ltd	2010
3	Sharma B. K.	Industrial Chemistry.	14 th Edn. Goel Publishing House	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Anthony D.Covington	Tanning Chemistry	The Science of Leather. RSC Publishing	2011
2	Fred, William T.Roddy & Robert M. Lollar	The Chemistry and Technology of Leather	1 st Edn.Reinhold Publishing Co.	1956

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
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Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. T.Gowrani 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY5AL	Title	Batch:	2021 – 2024
		Advanced Learner Course – I	Semester:	V
Lecture Hrs./Week	Self Study	Environmental Chemistry (Optional)	Credits:	4*

Course Objective

To enhance the knowledge on environmental chemistry and to inculcate the responsibilities in protecting the environment from chemical and biological pollutants.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the environmental constituents, air, water and soil contaminants and quality parameters.	K1,K2
CO2	Understand the environmental segments, composition and effects of pollution and types of biomedical wastes	K2, K3
CO3	Apply the suitable techniques for pollution control and waste management	K2, K3
CO4	Review the health, environmental and industrial problems caused by pollution	K4,K5
CO5	Distinguish various biomedical wastes judiciously and manage them properly	K4

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	-	-	-	M	M	H	H
CO2	H	H	H	-	-	-	M	M	H	H

CO3	H	H	H	-	-	-	M	M	H	H
CO4	H	H	H	-	-	-	M	M	H	H
CO5	H	H	H	-	-	-	M	M	H	H

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Earth and atmosphere Planet Earth-Formation of earth and atmosphere – Big bang theory, environmental segments- biosphere, lithosphere, hydrosphere, atmosphere, composition of atmosphere- troposphere, stratosphere, mesosphere, thermosphere, air quality parameters, methods of air pollution control – scrubbers, air filters, cyclones, electrostatic precipitators and incinerators.	-
Unit II	Contaminants and their degradation Causes, effects and control measures of Green house effect, global warming and ozone depletion - carbon cycle, nitrogen cycle, sulphur cycle, formation of CO in the atmosphere, organic pollutants, and contaminants from combustion.	-
Unit III	Water and Water Treatment Water- Hydrological cycle, water quality parameters, ground and surface water contaminants, Hardness-Units of hardness-Estimation of Hardness of water by EDTA method, problems of using hardwater in boilers – Scales and Sludge, corrosion, caustic embrittlement, priming and foaming, Water conditioning – internal and external conditioning of water – limesoda process, zeolite process, demineralization, desalination, electrodialysis, reverse osmosis, water treatment for municipal supply – physical and chemical methods of disinfection- break point chlorination, sewage treatment.	-
Unit IV	Soil Pollution Soil formation, soil characteristics, problems caused by landfills, Waste management – Solid waste management, E- waste management and plastic waste management.	-

Unit V	Biomedical waste Definition, Sources of biomedical wastes, various types of biomedical wastes, infection control practices, Biomedical waste management – segregation, storage, transportation, reuse, recycle, incineration, land fill and decomposition.	-
	Total Contact Hrs	-

Pedagogy: Self study

Assessment Methods: Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Monika Jain and Jain P.C	Engineering Chemistry	17 th Edn., Dhanpat Rai Publishing Company	2019
2	Dana Desonie	Atmosphere: Air Pollution and Its Effects	1 st Edn., Chelsea House Publications	2007
3	Anubha Kaushik	Environmental Science and Engineering	3 rd Edn., New Age international publishers.	2010
4	Shahanawaz Hamid	A Handbook on Biomedical Waste: National and International Overview, Notion press.	Notion press.	2019

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Linda. D. Williams	AP Environmental Science	5th Edn., McGraw-Hill Education	2017
2	R. Radhakrishnan	Biomedical waste management	Sumit Enterprises.	2007

3	R. Rajagopalan	Environmental Studies,	3rd Edn., Oxford University Press.	2015
4	John. H. Seinfeld, Spyros N. Pandis	Atmospheric Chemistry and Physics: From Air Pollution to Climate Change.	3rd Edn., Wiley.	2016

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. M. Selladurai 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme code:	B.Sc.	ProgrammeTitle :	Bachelor of Chemistry	
Course Code:	21UCY5S1	Title	Batch :	2021-2024
		Network and Information Security	Semester	V
Hrs/Week:	2		Credits:	2

Course Objective

To impart knowledge of Network security, Wi-Fi security, hackers, secure networking and password managers.

Course Outcomes

On the successful completion of the course students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basic concepts of network	K1,K2
CO2	Understand the network hacking techniques	K2, K3
CO3	Deploy information and network security	K2, K3
CO4	Understand the concept of network	K3
CO5	Analyse the advantage of internet	K3

Mapping with PO / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	M	M	-	-
CO2	M	H	M	M	M	H	M	M	-	-
CO3	H	H	H	M	H	M	M	M	-	-
CO4	H	M	H	M	M	M	M	M	-	-
CO5	H	H	H	M	H	M	M	M	-	-

H – High; M – Medium; L – Low

Unit	Content	Hrs
Unit I	Basics of Network – Network Media – Various Operating Systems – Basics of Firewalls on all Platforms including Windows, Mac OS and Linux.	3
Unit II	Security Vulnerabilities across an entire network – Network Hacking techniques and Vulnerability scanning.	3
Unit III	Configure and architect a small network for physical and wireless security – Firewalls configuration on Windows platform and Linux platform. Network privacy issues	3
Unit IV	Network monitoring to discover and identify potential hackers and malware using tools like WIRESHARK and SYSLOG. Online tracking by hackers	3
Unit V	Best methods of authentication including passwords, multifactor authentication including soft tokens and hard tokens. Best password managers to use–how passwords are cracked–how to mitigate the password attacks.	3
Total Contact Hrs		15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation, Materials will be made online through NGM Open source learning platforms

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms.R.Sudha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	21UCY5S2	Title	Batch :	2021-2024
		Cyber Security – Ethical Hacking	Semester	V
Hrs/Week:	2		Credits:	2

Course Objective

To understand the basics of cyber security and how ethical hacking is done on Cyber space and how to secure and protect them like security experts

Course Outcomes (CO)

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basic concepts of cyber security	K1,K2
CO2	Understand the knowledge about ethical hacking	K2, K3
CO3	Deploy the use of hacking tools	K2, K3
CO4	Understand the concepts of Network	K2
CO5	Advantages of internet	K3

Mapping with PO / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	M	M	H	H	M	M	-	-
CO2	M	H	M	H	M	M	M	M	-	-
CO3	H	H	H	M	H	M	M	M	-	-
CO4	H	M	H	M	M	M	M	M	-	-
CO5	H	H	H	H	H	M	M	M	-	-

H – High; M – Medium; L – Low

Unit	Content	Hrs
Unit I	To Understand how websites work, how to discover and exploit web application vulnerabilities and to gain full control over websites. Secure systems from all the known attacks. Secret tracking and hacking infrastructure.	3
Unit II	Ethical hacking in Cyber space - its fields and the different types of hackers. Hack & secure both Wi-Fi & wired networks	3
Unit III	Discover vulnerabilities & exploitation of hacking in cyber network servers. How secure systems are hacked using client-side and social engineering attacks. Use of hacking tools suchas Metasploit, Aircrack-ng, SQLmap.....etc.	3
Unit IV	Network basics & how devices interact inside a network - Network Penetration. Control connections of clients in network by password cracking. Fake Wi-Fi network creation with internet connection and spy on clients. To Gather detailed information about clients and networks like their OS, opened ports...etc.	3
Unit V	Explore the threat landscape - Darknets, dark markets, zero day vulnerabilities, exploit kits, malware, phishing and much more. Master defenses against phishing, SMShing, vishing, identity theft, scam, cons and other social engineering threats.	3
Total Contact Hrs		15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation, Materials will be made online through NGM Open source learning platforms

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms.R.Sudha	Name: Dr. Indumathy Ramasamy	Name: Mr. K. Srinivasan	Name: Dr. R. Manicka Chezian

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Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY611			Title	Batch:	2021 - 2024
				Core – IX: Physical Methods and Chemical Structure	Semester:	VI
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	1		Credits:	4

Course Objective

To make the students to acquire knowledge in basic concepts of spectroscopy, gain basic knowledge in various spectroscopic techniques like rotational, vibrational, Raman, UV-visible, NMR, EPR and Mass spectrometry and to understand the electrical and magnetic properties of molecules.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect and understand the basic theoretical concepts in various types of spectroscopy	K1, K2
CO2	Interpret the structure of the unknown molecules from the given spectra	K4
CO3	Evaluate various parameters like bond length, vibrational frequency, Chemical shift, coupling constant from different spectroscopic techniques	K4
CO4	Understand the crystal packing and defects in ionic and covalent solids	K2
CO5	Apply electrical and magnetic properties in solving the structures of the molecules	K3, K4

Mapping with PO / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	H	H	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H	H
CO3	H	M	H	H	H	H	H	H	H	H

CO4	H	M	H	H	H	H	H	H	H	H
CO5	H	M	H	H	H	H	H	H	H	H

H – High; M – Medium; L – Low

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Puri, B.R., Sharma L.R., and Pathania, M.S.	Principles of Physical Chemistry.	Vishal Publishing Co. 47 th edn	2017
2.	Sharma, Y.R.	Elementary Organic Spectroscopy	S. Chand & Company Pvt. Ltd. 5 th edn.	2013
3.	Gurdeep, C.& Anand, S.K.	Instrumental Methods of Analysis,	Himalaya Publishing House.	2005

Reference Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Kemp, W.	Organic Spectroscopy	ELBS edition	1985
2.	Banwell, C.N. McCash, E.M.	Fundamentals of Molecular spectroscopy.	Tata McGraw Hill, 4 th edn.	2016
3.	Sharma, B. K	Instrumental Methods of Chemical Analysis.	Goel Publishing House, 24 th edn.	2011

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. Indumathy Ramasamy 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY612			Title	Batch:	2021 - 2024
				Core – X Organic Chemistry - II	Semester:	VI
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	1		Credits:	4

Course Objective

To enhance the basic knowledge of the chemistry of solving problems, polynuclear hydrocarbons, amino acids, peptides, proteins, lipids, vitamins and chemotherapy.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember in solving problems of some functional groups and preparation, properties, reactions of polynuclear hydrocarbons	K1
CO2	Relate the structure and properties of amino acids, nucleic acids and peptides	K2
CO3	Analyze the classification, constitution and synthesis of proteins, lipids and vitamins	K4
CO4	Explain the synthesis of amino acids and peptides and functions, energy carriers of nucleotides.	K5
CO5	Develop the skill to classify the drugs such as chemotherapy, sulphad rugs , antimalarials, ane asthetics and antibiotics	K3

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	M	H	H	-	-
CO2	H	H	H	M	H	M	H	H	-	-

CO3	H	H	H	M	H	M	H	H	-	-
CO4	H	H	H	M	H	M	H	H	-	-
CO5	H	H	H	M	H	M	H	H	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Polynuclear hydrocarbons: Condensed systems – Naphthalene, Anthracene and phenanthrene - Preparation, properties and uses. Structural elucidation of Naphthalene and Anthracene. Solving problems of structures of organic compounds based on reactions of the following: Aldehydes, Ketones, Amines, Nitro-compounds, Phenols and Acids.	12
Unit II	Amino acids: Definition – chemical and physical properties of amino acids. Synthesis and properties by the following methods: Amination of α - halo acids, Gabriel's phthalimide and Strecker synthesis method. Terminal residual Analysis: N-Terminal end by Sanger's method and C-Terminal end by reduction method. Proteins and Peptides: Primary, secondary, tertiary and quaternary structures of proteins. Denaturation and biological functions of proteins. Synthesis of polypeptides by carbobenzoxy method (Bergmann method).	12
Unit III	Nucleic acids: Definition, chemical composition and nitrogen bases present in nucleic acids. Nucleosides and Nucleotides with examples. Functions of nucleotides. Nucleotide as energy carriers. Structure, replication and functions of DNA. Structure and functions of RNA. Lipids: Classification - oils and fats - structure, chemical reactions, saponification value and iodine value.	12
Unit IV	Vitamins: Introduction – Importance of vitamins - classification as fat and water soluble vitamins and deficiency diseases. Constitution and Synthesis of the following: Vitamin A1 (Retinol), Vitamin B1 (Riboflavin), Pyridoxine and Ascorbic acid	12
Unit V	Chemotherapy: Introduction, Definition and classification of drugs. Sulphad drugs: Structure and uses of sulphanilamide, sulphapyridine, sulphadiazine, sulphaacetamide, sulphathiazole and sulpha guanidine. Mode of action. Antimalarials: Classification, structure and uses of chloroquine and pamaquine. Anaesthetics: characteristics, structure	12

	and uses of Procaine and Pentothal sodium. Antibiotics: Introduction, structure and uses of Penicillin and Tetracycline. (Note: Structural elucidation of drugs not required)	
	Total Contact Hrs	60

Pedagogy: Direct Instruction, Digital Presentation and Flipped Class

Assessment Methods: Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Chawla, H. M. & Soni, P. L.	Textbook of organic chemistry	New Delhi: Sultan Chand and Sons Pvt. Ltd.	2019
2	Bahl, B.S. & Arun Bhal	Advanced organic chemistry. 5th edn.	New Delhi: Sultan Chand and Sons Pvt. Ltd.	2012
3	Finar, I. L	Stereochemistry and the chemistry of natural products (Vol II). 5th edn	New Delhi: Pearson Education India Pvt. Ltd.	2011

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Gurdeep, R C	Organic chemistry of natural products (Vol – I and II). 4th edn	Mumbai: Himalaya Publishing House Pvt. Ltd	2019
2	Agarwal, O. P.	Organic chemistry of natural products, (Vol. I)	Meerut: Krishna Prakashan Media (P) Ltd	2015

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of Examination
Name with Signature	Name with Signature	Name with Signature	Name with Signature

Name : Dr. M. Selladurai 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 
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Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY613			Title	Batch:	2021 – 2024
				Core - XI	Semester:	VI
Lecture Hrs./Week	4	Tutorials /Sem	2	Chemical Kinetics and Quantum mechanics	Credits:	4

Course Objective

To acquire the necessary knowledge on type of reactions, determination of rate, theories of reaction rate, mechanism of catalytic action, basics and kinetics of photochemical reactions and the fundamentals of quantum mechanics.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recognize the basic terminologies of chemical kinetics	K1
CO2	Understand the theories of reaction rates	K2
CO3	Analyse the types and kinetics of catalysis, adsorption isotherms and their significance.	K3
CO4	Describe the laws of photochemistry and theories of reaction rates and explain various photochemical processes using Jablonski diagram	K4&K5
CO5	To become familiar with the quantum mechanical functions and operators	K2

Mapping with POs / PSOs Vs COs

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO										
CO1	H	H	M	M	H	H	M	M	-	-
CO2	M	M	H	M	M	M	M	M	-	-

CO3	H	H	M	L	H	M	M	H	-	-
CO4	M	H	H	M	H	L	H	M	-	-
CO5	M	M	M	M	M	M	L	H	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Chemical Kinetics-I: The concept of Reaction Rate, Rate law and Rate equation. Factors influencing rates of chemical reactions. Order and Molecularity of a reaction. Setting and solving simple differential equations for first order, Second order and Zero order reactions. Pseudounimolecular reactions. Half-life time of a reaction – Expressions for $t_{1/2}$ for first, second and nth order reactions. Experimental techniques for measuring reaction kinetics – Volumetry and Polarimetry.	12
Unit II	Chemical Kinetics-II: Methods of determining order of a reaction – Differential rate expressions, Integral rate expressions and Half-life method. Equilibrium approximation and Steady state approximation. Effect of Temperature on reaction rates – Temperature co-efficient, The Arrhenius equation – Derivation, activation energy and its determination. Theories of reaction rates: Lindemann theory of Unimolecular reactions, Collision theory and Absolute reaction rate theory (Derivation not necessary).	12
Unit III	Catalysis: General characteristics of Catalytic reactions. Types of catalysis – Theories of Homogeneous and Heterogeneous catalysis- Kinetics of acid base catalyzed reactions. Enzyme catalysis: Kinetics of enzyme-catalysed reactions – Michaelis-Menten equation. Effect of Temperature and pH on enzyme catalysis. Adsorption: Chemisorption and physisorption, Adsorption of gases by solids. Factors affecting adsorption – Types of adsorption isotherms – Freundlich adsorption isotherm and Langmuir adsorption isotherms.	12
Unit IV	Photochemistry: Consequence of light absorption – The Jablonski diagram, Laws of Photochemistry - Lambert and Lambert-Beer's laws, Grothus-Draper law, The Stark-Einstein law of photochemical equivalence, Quantum efficiency and its determination.	12

	The photochemical rate law: Kinetics of H ₂ - Cl ₂ reaction, Kinetics of H ₂ -Br ₂ reaction, Comparison of thermal and photochemical reactions. Photosensitization and Quenching, Chemiluminescence. Lasers and their uses (Elementary idea only).	
Unit V	Quantum Mechanics: The need for quantum mechanics. Functions: Real, complex, odd, even, orthogonal and normalized functions. Operators: linear and non-linear, differential, Hermitian, Hamiltonian, momentum (linear and angular) commutator (Theorems) and non- commutators, Eigen functions and eigen values. Postulates of quantum mechanics (statements only).	12
	Total Contact Hrs	60

Pedagogy: Direct Instruction, Power point presentation, Group learning, Student seminar and Flipped Class

Assessment Methods: Test, Seminar, Quiz, Assignments, Group Task-GD.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1	Puri, Sharma and Pathania	Principles of Physical Chemistry	Vishal Publishing Co.,	2020
2	Mandeep Dalal	A Textbook of Physical Chemistry	Volume 11 st Edition. Dalal Institute	2018
3	Soni. P.L. and Dharmarha.O.P	Text book of Physical Chemistry	23 rd revised Edition. New Delhi: Sultan Chand & Sons.	2016
4	Ajoy Ghatak	Basic Quantum mechanic	Laxmi Publications.	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
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1	Puri and Sharma and Kalia. K.C	Principles of Inorganic Chemistry	33 rd Edition. Milestone Publishers and Distributors.	2016
2	Jain. P.C and Monika Jain	Engineering Chemistry	17 th Edition. Dhanpat Rai Publishing Company (P) Ltd.	2015
3	Moudgil. H.K	Text Book of Physical Chemistry	2 nd Edition. Delhi: PHI Learning Pvt. Ltd	2015

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. M. Amutha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY614			Title	Batch:	2021 – 2024
				Core – XII Polymer Chemistry	Semester:	VI
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	1		Credits:	4

Course Objective

To learn about recent advances in polymers, impart knowledge about polymerization reactions and stereo chemistry, familiarize the different polymer processing techniques and synthesis of some commercially important polymers.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Classify the types of polymers and recognize the basic concepts	K2
CO2	Understand and illustrate the mechanisms of polymerization	K2, K3
CO3	Appraise the stereochemistry of polymers and apply Z-N catalyst for the polymers	K4, K3
CO4	Calculate the molecular weight of polymers by various methods	K3
CO5	Acquiring knowledge of commercially important polymer products and its applications.	K2, K5

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	M	M	-	-
CO2	H	H	H	M	M	M	M	M	-	-
CO3	H	H	H	M	M	M	M	M	-	-

CO4	H	H	H	M	M	M	M	M	-	-
CO5	H	H	H	M	M	M	M	M	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Basic Concepts and Classification of Polymers: Monomers, Polymers, Polymerization, Degree of polymerization. Classification of polymers: Plastics: Definition - Thermoplastic, Thermosetting plastics and Reinforced Plastic. Elastomers: Definition - Natural & synthetic rubber -smoked rubber -Reclaimed rubber -Foam rubber -Spongy rubber - Laminate rubber. Adhesives: Definition - thermosetting - thermoresins. Fibres: Definition-Natural and synthetic. Classification: comfort-safety- Industrial fibres. Primary And Secondary Bond Forces In Polymers. Thermal stabilisers- Antioxidants- photo stabilisers. Polymerization Techniques: Bulk, Solution, Suspension and Emulsion Polymerization.	13
Unit II	Types of polymerization reactions: Addition Polymerization and Condensation polymerization. Types of Initiators. Inhibitors. Chain transfer agents. Addition Polymerization – Free radical Mechanism, Ionic Polymerisation: Anionic and Cationic Polymerizations. Step growth of polymerisation (Condensation polymerisation) Copolymers - Types, Co-Polymerisation: Random-Alternating-Block and Graft copolymers. Importance of Copolymerization. Miscellaneous Polymerization reactions- Electrochemical Polymerization.	12
Unit III	Stereochemistry of Polymers: Stereo Regular Polymers: Isotactic, syndiotactic & Atactic. Geometrical isomers. Factors influencing Structural regularity. Ziegler-Natta Catalysts - Bi metallic and Mono metallic mechanisms. Glass transition temperature (T _g) and T _m . Determination of T _g by differential scanning calorimeter. Factors affecting T _g , T _g of copolymers. Degradation - Types of degradation - Thermal, Photo, High energy radiation and Oxidative method and Hydrolytic method. Polymer Additives - Fillers, Plasticizers, antioxidants, thermal stabilizers, fire retardants and colourants.	13

Unit IV	Determination of Molecular Weight Methods: Molecular weights of polymers: Number-Average, Weight-Average, Sedimentation-Average & Viscosity-Average molecular weights. Molecular weight distribution – GPC method. Determination of Average molecular weight: Ebulliometry method, Cryoscopy method, osmometry method, Light Scattering method, Viscosity method and End group Analysis. Application of FTIR, UV-visible, NMR, and Mass Spectroscopy for Identification of polymers.	12
Unit V	Industrial Polymers: Polymer processing techniques: Calendaring, film casting, compression moulding, blow moulding, extrusion moulding foaming and filament winding technique. Preparation and uses of the following polymers: Polyethylene (LDPE & HDPE), P.V.C, Teflon, polystyrene, Nylon-6, Nylon-66, Polyester, Phenol formaldehyde resins, Polymethylmethacrylate, Polyethyleneterephthalate and Polycarbonates. Recent Advances in Polymers: Polymer and environmental effect- introduction- disposal of polymer waste- recycling system- importance of biopolymers.	10
	Total Contact Hrs	60

Pedagogy

Instruction, Digital Presentation, Flipped Class

Assessment Methods

Test, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Fred.W.Billmeyer	Text Book of Polymer Science	2 nd Edn. John Wiley.	2011
2	Gowariker.V.R., Viswanathan. N.V., Jeyadev Sreedhar	Polymer Science	2 nd Edn.New Age International Ltd	2015

3	Sharma B. K.	Polymer chemistry.	4 th Edn. Goel Publishing House	2015
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Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ahluwalia V.K. & Anuradha Mishra	Polymer Science: A Text Book	1st Edn. Ane Books.	2008
2	Stevens M.P.	Polymer Science: An Introduction	3rd Edn. Oxford Publication	2009
3	Fred J.R.	Polymer Science and Technology.	3rd Edn. Prentice-Hall of India.	2014

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. T.Gowrani 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme code:	B.Sc.	ProgrammeTitle :	Bachelor of Chemistry	
Course Code:	21UCY6E1	Title	Batch :	2021-2024
		Core Elective - II : Analytical	Semester	VI
Hrs/Week:	4	Chemistry - II	Credits:	5

Course Objective

To acquire knowledge on basic concepts in separation techniques, volumetric analysis, various types of titrations, and Core Elective - II : Analytical Chemistry understand the basic principles of instrumentation.

Course Outcome

On the successful completion of the course students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic principles of UV-visible spectrophotometer and IR spectrophotometer.	K1,K2
CO2	Apply separation techniques for the extraction of solvents	K2, K3
CO3	Understand the basic principles involved in neutralization titrations, PH and Buffer solutions.	K2, K4
CO4	Know about different types of titrations	K3
CO5	Gain knowledge on Analytical method in chemistry	K2, K5

Mapping with PO / PSOs Vs Cos

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	H	H	H	H
CO2	H	H	H	M	M	H	H	H	H	H
CO3	H	H	H	M	H	M	H	M	H	H
CO4	H	H	H	M	M	M	H	H	H	H
CO5	H	H	H	M	H	M	H	H	H	H

H – High; M – Medium; L – Low

Unit	Content	Hrs
Unit I	Instrumentation: Basic principles of UV-visible spectrophotometer, Lambert-Beer law and its limitations. Instrumentation consisting of source, monochromator, grating and detector. Applications of UV-visible spectroscopy. Basic principles of IR spectrophotometer, Instrumentation consisting of source, monochromator, grating and various detector. Spectrophotometric determination. Characteristic absorption bands of various functional groups. Applications of infrared spectroscopy.	12
Unit II	Separation techniques: Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and nonaqueous media.	12
Unit III	Neutralisation Titrations: Principles of titrimetric analysis, titration curves for strong acid-strong base, weak acid-strong base, strong acid-weak base titrations, Indicators: Theory and the choice in acid-base titration. pH and Buffer solution: pH of strong and weak acid solutions. Buffer solutions. Henderson equations. Preparation of acidic and basic buffers.	12
Unit IV	Redox Titration: Principle, Different types of Redox Titrations, Redox indicators and choice of redox Indicators. Complexometric Titrations: Theory of complexometric titration, indicators for EDTA titration, determination of total hardness of water by complexometric titration with EDTA. Precipitation Titrations: Indicators for Argentometric titrations, Estimation of chlorides by Volhard's Method.	12

Unit V	Analytical method in chemistry: Analysis of water -Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. a. Determination of pH, acidity and alkalinity of a water sample.	12
	Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration. a. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.	
	Total hours/Semester	60

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	S M Khopkar	Basic concepts of Analytical Chemistry.	New Age International Pvt Ltd, 4 th Edition.	2020
2	Chatwal and Anand	Instrumental Methods of Chemical Analysis.	Himalaya publishing House, 5 th Edition.	2014
3	Willard, H. H	Instrumental Methods of Analysis.	CBS Publishers	1998
4	Svehla. G	Vogel's Qualitative Inorganic Analysis.	Prentice Hall, 7 th Edition.	1996

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	D.A. Skoog, D.M. West, F.J. Holler and S.R.	Fundamentals of Analytical Chemistry	Cengage Learning	2018
2	Usharani. S	Analytical Chemistry	Macmillan India Ltd, 1 st Edition	2000
3	Skoog, D.A.; West, D.M. & Holler, F.J	Fundamentals of Analytical Chemistry	Saunders College Publishing, Fort Worth, 6th Ed.	1992
4	Arthur. I. Vogel	Inorganic Quantitative Analysis	Longman, 4 th Edition.	1978
5	Skoog & Lerry	Instrumental Methods of Analysis	Saunders College Publications, New York	

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms.R.Sudha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY6E2			Title	Batch:	2021 – 2024
				Core Elective- II	Semester:	VI
Lecture Hrs./Week	4	Tutorial Hrs./Sem.	10	Pharmaceutical Chemistry-II	Credits:	5

Course Objective

To inculcate the basic knowledge on the preparation, properties and uses of some organic, inorganic and radioactive drugs to make the students opt their career in pharmaceutical industry.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the names of organic, inorganic and radioactive drugs and their basic analysis.	K1
CO2	Understand the preparation of organic and inorganic drugs and the principles behind their analysis.	K2
CO3	Apply the properties of pharmaceuticals towards their respective applications.	K3
CO4	Sketch the radioactivity, precautions and the storage conditions of radioactive drugs.	K3
CO5	Analyze and apply the available analytical techniques towards the quantification of organic and inorganic pharmaceuticals.	K3&K4

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	-	-	-	H	H	H	H
CO2	H	H	H	H	M	-	H	H	H	H

CO3	H	H	H	M	-	-	H	H	H	H
CO4	H	H	H	-	-	-	H	H	H	H
CO5	H	H	H	H	M	-	H	H	H	H

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Important organic Drugs: Definition, chemical structure, method of preparation, important physical and chemical properties and uses of the following organic drugs Sulphonamides – sulfacetamide, Antileprotic Drugs – Dapsone, Anti-tubercular Drugs- Isoniazid, Antibiotics- Ampicillin, Antimalarial Drugs-Chloroquine, Hypnotics- Phenobarbitone, Diuretic Drugs- Furosemide, Cardiovascular Drugs- Ethylnitrite and Analgesics and Anti-pyretics- Aspirin.	13
Unit II	Important Inorganic Drugs: Definition, properties and medicinal uses of the following inorganic compounds. Electrolytes used in the replacement therapy- Sodium chloride, Calcium gluconate, Gastrointestinal agents Acidifiers- Ammonium chloride, Sodium Bicarbonate, Antimicrobials-Hydrogen peroxide, Chlorinated lime, Expectorants- Ammonium Chloride, Emetics- Copper sulphate, Haematinics- Ferrous sulphate, Antidote- Sodium thiosulphate.	13
Unit III	Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α , β , γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide (I_{121}), Storage conditions, precautions & pharmaceutical application of radioactive substances.	10
Unit IV	Pharmaceutical Analysis: Non- aqueous titrations - Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate, Precipitation titrations: Mohrs method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride, Complexometric titration: Classification, metal ion indicators, estimation of Magnesium sulphate, Redox titrations- Concepts of oxidation and reduction, Types of redox titrations (Principles and applications) Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry.	12

Unit V	Electrochemical methods of analysis - Conductometry - Introduction, Conductivity cell, Conductometric titrations, applications, Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.	12
	Total Contact Hrs	60

Teaching Methods: Chalk & Talk, Power point Presentations, Group discussions, Seminar, Quiz, Assignment.

Text Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Vardanyan R.S., Hruby V. J	Synthesis of Essential Drugs	1 st Edn., Elsevier.	2006
2	Gundu Rao. P	Pharmaceutical and Medical Inorganic Chemistry and updated version of Inorganic Pharmaceutical Chemistry	1 st Edn., Vallabh Prakashan publisher.	2008
3	Gurdeep R Chatwal, Madhu Arora	Analytical Chemistry	1 st Edn., Himalaya Publishing House	2008
4	Chatwal. G.R	Pharmaceutical Chemistry-Inorganic	5 th Edn., Himalaya Publishing House.	2017
5	Atherden L.M	Bentley and Driver's Textbook of Pharmaceutical Chemistry	1 st Edn., Oxford University Press.	2020

Reference Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Vogel A. I, Bassett, Jeffrey, Mendam and Denney	Vogel's Textbook of Quantitative Chemical Analysis	1 st Edn., Longman Higher Education Publisher.	1994
2	Skoog A, West D. M, Holler F. J	Fundamentals of Analytical Chemistry	Cengage Learning Publisher..	2004
3	Abhishek Tiwari, Neeraj Upmanyu, Anup K. Chakraborty	Pharmaceutical Organic Chemistry-I	1 st Edn., Nirali Prakashan Publisher.	2017
4	Rajasekaran	Textbook of Pharmaceutical Inorganic Chemistry Theory and Practical	2ndEdn., CBS Publication.	2019
5	M. Ali	Textbook of Pharmaceutical Chemistry I (Inorganic)	1stEdn., CBS Publication	2020

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. Indumathy Ramasamy 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY6E3	Title	Batch:	2021 - 2024
		Core Elective- II- Agricultural Chemistry and Analytical Techniques for Agrochemicals	Semester:	VI
Lecture Hrs./Week	4		Credits:	5

Course Objective

To give the students the importance of Agricultural chemistry and an exposure to find, analyse and find a suitable method to cultivate and promote agricultural methods.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	To understand the nature of soil.	K1,K2
CO2	Gain Knowledge on Soil fertility and Organic Manures	K2, K3
CO3	Find applications of Pesticides, Rodenticides and Herbicides and weedicides	K3
CO4	Know the analysis of agrochemicals by Potentiometry and Electrical conductivity	K4
CO5	Know the application of Non Instrumental Techniques in the analysis of agrochemicals	K4

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	M	M	M	M
CO2	H	H	H	M	M	M	M	M	M	M
CO3	H	H	H	M	M	M	M	M	M	M
CO4	H	H	H	M	M	H	H	H	M	M

CO5	H	H	H	M	M	H	H	H	M	M
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High- H,Medium-M, Low-L

Unit	Content
Unit I	Soil chemistry: Soil analysis . Composition of soil : Organic and Inorganic constituents. Soil acidity : buffering capacity of soils. Limiting of soil. Absorption of cations and anions : availability of soil nutrients to plants..
Unit II	Soil fertility and productivity: Organic Manures - Farmyard Manure - Compost - Oil cakes - Bone meal - Meat meal - Fish meal - Blood meal and green Manures - Fertilizers - Classification of fertilizers - Requisites of a good fertilizers - NPK fertilizers - ill effects of fertilizers - effect of mixed fertilizers on soil pH - Micronutrients - role of micronutrients sources - Need for nutrient balance - Soil management and Micronutrients needs.
Unit III	Insecticides: stomach and contact poisons. Plant derivatives: pyrethrine, Nicotine and rotenone Synthetic organic: carbophos, carbaryl, p-DCB, dimethoate, butachlor, Endrin, Aldrin (Chemical name and uses). Fungicides: Inorganic (Bordeaux Mixture) and organic(dithiocarbamate). Industrial fungicides: creosote fractions. Herbicides and weedicides: Selective and non-selective, 2, 4-D and 2, 4, 5-t (structure and function) Intenerated pest management.
Unit IV	Potentiometry: Measurement of EMF, PH-metry and its applications in the analysis of pesticide residues in Agrochemicals, Food, Juices and Water. Electrical conductivity: Electrical conductivity of electrolyte, Conductivity meter, Specific and Equivalent conductivities, Applications of conductivity measurement in the Analysis of Salinity, Halide and Soil moisture.
Un it V	Non Instrumental Techniques: Acid base titrations acid-base indicators; Redox titrations determination of halide ions by Complexometric titration, Precipitation titrations methods of determination of Mg, Zn, Ca, Al, Cu, Metallochromic indicators, Gravimetric estimation of SO_4^{2-} and Fe^{+++} .

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

21UCY6E23

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Jayashree Ghosh	Fundamental concept of Applied chemistry.	S. Chand & Company Ltd.,	2010
2	B.A. Yagodin (Ed).	Agricultural Chemistry.	2 Volumes, Mir Publishers Moscow	1984
3	K.Bagavathi - Sundari	Applied chemistry,	MJP Publishers.	

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	T.D. Biswas and S.K. Mukerijee	Text book of soil science.	McGraw Hill Education, 2 nd Edition.	2017
2	G.T. Austin	Shreve's Chemical Process Industries.	Mc-Graw-Hill, 5 th Edition.	2017
3	Nyle.C.Bready	The nature and properties of soils.	Pearson Education, 14 th Edition.	2012
4	Louis M.Thompson - and Frederick. R.Troch	Soils and soil fertility.	Oxford University Press Inc. 5 th Edition.	1993

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms.R.Sudha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY615	Title	Batch:	2021 - 2024
Practical Hrs./Week	6	Core Practical - III	Semester:	VI
		Gravimetric Analysis and Physical Chemistry Experiments	Credits:	5

Course Objective

To develop practical and analytical skills in gravimetry and physical chemistry.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concept of gravimetric analysis	K1
CO2	Analyse cations and anions quantitatively using gravimetric method	K1-K4
CO3	Enable the students to acquire practical skills in physical chemistry experiments	K3
CO4	Perform conductometric and potentiometric titrations and arrive the endpoint	K3,K4
CO5	Perform graphical analysis based on experimental data and to validate the experimental results	K5

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	H	H	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H	H
CO3	H	M	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	H	H	H	H
CO5	H	M	H	H	H	H	H	H	H	H

High- H, Medium-M, Low-L

Units	Content	Hrs
	I: Gravimetric Estimations: 1. Lead as Lead Chromate 2. Barium as Barium Chromate 3. Barium as Barium Sulphate 4. Calcium as Calciumoxalate 5. Magnesium as Magnesiumoxinate 6. Nickel as dimethylglyoxime complex (any Four) II: Physical Chemistry: 507 1. Heterogeneous Equilibria: i) Determination of transition temperature (thermometric method) a) Sodium acetate b) Sodium thiosulphate c) Strontium chloride d) Sodium bromide ii) Eutectic systems: a) Naphthalene and diphenyl b) Naphthalene and diphenylamine	

	c) Naphthalene and benzophenone d) Naphthalene and p-nitrotoluene iii) Critical solution temperature: a) Phenol – Water system. b) Effect of NaCl on C.S.T. (between 1 to 2 %) c) Effect of Succinic acid on C.S.T. (between 1 to 3 %) d) Determination of unknown concentration of the given NaCl/Succinic acid using C.S.T iv) Molecular weight determination: Rast's method Solvents – Naphthalene and diphenyl. 2. Kinetics: a) Acid catalysed hydrolysis of methyl acetate b) Hydrolysis of ethyl acetate with NaOH 3. Conductivity Experiments: a) Cell constant b) Verification of Debye – Huckel Onsager Equation c) Conductometric Acid – Base titrations (HCl x NaOH) 4. Potentiometric Titrations a) Acid – Base titration (HCl x NaOH) b) Redox titrations (FeSO₄ x K₂Cr₂O₇)	
	Total Contact Hrs/semester	90

Demonstration and individual hands on practical.

Assessment Methods

Performance of laboratory work, Report, Recording the report, Submission of the record

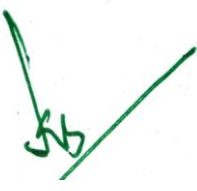
Text Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION

1.	Venkateswaran, V.Veerawamy, R.Kulandaivelu, A.R.	Basic Principles of Practical Chemistry	S. Chand & Sons,	2017
2.	Thomas, A.O.	Practical Chemistry for B.Sc. Main Students.	Sharada press, 8 th edn.	2000

Reference Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Jeffery, G.H. Bassett, J. Mendham, J. Denney. R.C.	Vogel's Textbook of Quantitative Chemical Analysis.	Bath Press, 5 th edn.	1989
2.	Yadav, J.B.	Advanced Practical Physical Chemistry	Goel Publishing House	2014

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. Indumathy Ramasamy 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	21UCY6AL	Title	Batch:	2021 - 2024
		Advanced Learner Course – II:	Semester:	VI
Lecture Hrs./Week	Self study	Applications of Spectroscopy (Optional)	Credits:	4*

Course Objective

To acquire knowledge and skills in the interpretation of various spectra of the molecules and applications of spectroscopy.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Calculate the absorption maxima and interpret the types of electronic transitions of compounds in absorption spectra	K3, K4
CO2	Analyse the IR spectra and predict the type of functional group	K4
CO3	Identify the structure of molecule with the NMR Spectra	K4
CO4	Determine and deduce the molecular mass and structure of the molecules using fragmentation pattern of mass spectra	K3, K4
CO5	Apply the knowledge of hyperfine splitting in the prediction of EPR spectra	K3

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	M	H	H	H	H	H	H	H	H
CO2	H	M	H	H	H	H	H	H	H	H
CO3	H	M	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	H	H	H	H

CO5	H	M	H	H	H	H	H	H	H	H
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H – High; M – Medium; L – Low

Units	Content
Unit I	UV-visible spectroscopy: Principles, absorption bands, Effect of temperature and solvent on the fine structure of absorption bands, Woodward-fieser Rules for calculating absorption maximum in poly-ynes and α , β -unsaturated carbonyl compounds, acids and esters. Electronic transitions for charge transfer complexes, spectrophotometric titrations.
Unit II	IR Spectroscopy: Principles, sampling techniques , Interpretation of spectra of hydrocarbons, halogen compounds, alcohols, phenols, ethers, carbonyl compounds, esters, acids, amides, acid anhydrides and nitro compounds. Application of IR to quantitative analysis and Limitations of IR spectroscopy.
Unit III	NMR spectroscopy: Principle, Instrumentation , Chemical Shift, splitting of signals, Interpretation of NMR spectra of organic molecules like propene, 1-pentyne, butyl methyl ether, acetaldehyde, acetone, ethyl acetate, acetic acid, 1-nitrobutane. ^{13}C spectroscopy, Chemical shift, proton coupled and decoupled ^{13}C spectra and Applications of NMR spectroscopy.
Unit IV	Mass Spectroscopy: Principles, Instrumentation, General fragmentation modes , Interpretation of mass spectra of compounds containing different functional groups, Applications of Mass spectrometry and solving numerical problems of mass spectrometry pertaining to simple organic compounds.
Unit V	EPR Spectroscopy: Theory, Instrumentation, g-factor and hyperfine splitting . EPR spectra of the following compounds 1,4-Benzoquinone radical anion, naphthalene negative ion, Co^{2+} and Cu^{2+} systems. Anisotropic systems: anisotropic effect, zero-field splitting, Kramer's degeneracy and applications of ESR spectroscopy for organic and inorganic systems.

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Sharma, Y.R.	Elementary Organic Spectroscopy, 5 th edn.	S. Chand & Company Pvt. Ltd.	2013
2.	Gurdeep, C.& Anand, S.K.	Spectroscopy. 5 th edn.	Himalaya Publishing House	2002
3.	Kemp, W.	Organic Spectroscopy	ELBS edition	1985

Reference Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Silverstein, R. M., Bassler, G. C. and Morrill, T. C.	Spectrometric identification of organic compounds	Wiley India Pvt. Ltd. 6 th edn.	1991
2.	Kalsi, P.S.	Spectroscopy of Organic Compounds.	New Age International Pvt Ltd Publisher, 6 th edn	2007
3.	Pavia, D.L., Lampman, G.M., Kriz, G.S. and Vyvyan, J.R.	Spectroscopy.	Brooks/Cole, Cengage Learning. 1 st edn	2008

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. Indumathy Ramasamy	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian

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Programme code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	21UCY6S1	Title	Batch :	2021-2024
		Skill Based Elective –II	Semester	VI
Hrs/Week:	2	Green Chemistry	Credits:	2

Course Objective

To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Define the green chemistry	K1
CO2	Understand the basic principles of green chemistry	K2
CO3	Identify the environment friendly technologies and working conditions	K3
CO4	Analyse eco-friendly and less wasteful manufacturing process for the sustainable development of our country	K2 & K3
CO5	Know about the various analytical green methods	K3

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	M	M	M	M	M	M	M	-	-
CO2	M	M	M	M	M	M	M	M	-	-
CO3	H	M	M	M	H	M	M	M	-	-

CO4	H	H	H	M	H	M	M	M	-	-
CO5	M	M	H	M	M	M	M	M	-	-

High- H, Medium-M, Low-L

Unit	Content	Hrs
Unit I	The need for green chemistry: Sustainability and cleaner production. Greenchemistry and Eco- efficiency. Environmental Protection Laws. Challenges ahead for a chemist. Green chemistry education. Future trends in Green Chemistry: Green nano-synthesis and Green polymer chemistry.	3
Unit II	Twelve Principles of Green Chemistry: Explanation with examples. AwardsforGreen Chemistry.	3
Unit III	Water as greener solvent: An alternative approach to solvent chemistry: Solvent free reactions. Solvent free microwave assisted organic synthesis. Ionic Liquids: Prospects and Retrospects	3
Unit IV	Super critical fluid extraction: Supercritical fluids. Advantages and applications of super fluid extraction technology. Carbon dioxide as a super critical fluid: Advantages and industrialapplications.	3
Unit V	Green Techniques: .Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation. Oxidation technology for waste water treatment-photocatalytic oxidation.Chitin – Green polymer.	3
	Total contact Hrs/Semester	15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Indu Tucker Sidhwani and Rakesh K. Sharma	An Introductory Text on Green Chemistry: For Undergraduate Student.	Wiley.	2020
2	V. Kumar	An Introduction to Green Chemistry.	1st (Reprint) Edition. Vishal Publishing Co.,	2013
3	Rashmi Sanghi and M.M. Srivastava	Green Chemistry, (Environment Friendly Alternatives).	1 st Edition. Narosa Publishing House, New Delhi.	2007

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Asim K. Das	Environmental Chemistry with Green Chemistry.	1 st Edition. Books and Allied (P) Ltd., Kolkata	2014
2	Samuel Delvin	Green Chemistry.	1 st Edition. IVY Publishing House, New Delhi.	2006
3	V.K. Ahluwalia	Green Chemistry (Environmentally Benign)	1 st Edition. Ane Books Pvt.Ltd., New Delhi.	2006

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature

Name: Ms.R.Sudha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 
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Programme code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	21UCY6S2	Title	Batch :	2021-2024
		Skill Based Elective-II	Semester	VI
Hrs/Week:	2	Clean energy	Credits:	2

Course Objective

To develop the theoretical knowledge in practical chemistry.

Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Know about renewable and non-renewable energy resources	K1,K2
CO2	Understand solar energy and working of solar cells	K2, K3
CO3	Develop knowledge on working of wind mill	K1, K2
CO4	Find the application of bio energy	K3
CO5	Study environmental aspect of Tidal, ocean and geothermal energy	K3

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	M	M	-	L
CO2	H	H	H	M	M	M	M	M	-	L
CO3	H	H	H	M	M	M	M	M	-	L
CO4	H	H	H	M	M	M	M	M	-	L
CO5	H	H	H	M	M	M	M	M	-	L

H – High; M – Medium; L – Low

Unit	Content	Hours
Unit I	Consumption of energy - Indian and global energy status- commercial and non – commercial energy sources. Renewable and non-renewable energy resources- Conservation of energy.	3
Unit II	Solar energy: Solar Radiation – Solar Thermal Collectors – Flat Plate and Concentrating Collectors– Solar Applications – fundamentals of photo Voltaic Conversion – Solar Cells – PV Systems – PV applications.	3
Unit III	Wind energy: Wind power – mean wind velocity- factors affecting velocity- Wind Energy generators-types.-construction of a Wind Turbine - Important Factors for building windmill.	3
Unit IV	Bio – energy: Biomass, Biogas, Source, Composition, Technology for utilization – Biomass direct combustion – Biomass gasifier – Biogas plant – Digesters – Ethanol production., Bio-Diesel production.	3
Unit V	Tidal, ocean and geothermal energy: Wave energy - converting system. Ocean thermal energy -Open and closed cycles. Geothermal energy sources-utilizations- environmental aspects.	3
	Total contact Hrs/Semester	15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION

1	Solanki C.S	Solar Photovoltaic Technology and Systems.	Prentice Hall India Learning Private Limited	2013
2	Rai, G.D.	Non Conventional Energy Sources.	Khanna publishers New Delhi	1999

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Asim K Das	Environmental chemistry with Green chemistry	Books and Allied (P) Ltd, Kolkata	2010
2	Sukhatme, S.P.	Solar Energy	Tata McGraw-Hill Publishing Company Ltd	1997

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms.R.Sudha 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 



2022 - BATCH

**III & IV -
SEMESTERS**

Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY304			Title	Batch:	2022 – 2025
				Core Paper- III	Semester:	III
Lecture Hrs./Week	6	Tutorial Hrs./Sem.	2	Inorganic and Physical Chemistry	Credits:	4

Course Objective

To impart knowledge on basic metallurgical process, alloys, fuels and fertilizers and to expound conceptions on thermodynamics of solutions, phase equilibria and colligative properties to succeed at an entry-level position in chemical industry or a chemistry graduate program.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic metallurgical operations and understand the preparation and properties of alloys.	K1& K2
CO2	Understand the classification and properties of fuels and fertilizers	K2
CO3	Apply the concept of law of mass action to various equilibria	K3
CO4	Understand the concepts of thermodynamics of solution and construct and analyse the phase diagram.	K2 &K5
CO5	Correlate the relationship between colligative properties of dilute solutions and molecular mass of solute.	K5

Mapping with POs / PSOs Vs COs

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO										
CO1	H	M	M	M	H	H	M	H	-	M
CO2	H	H	H	M	M	M	H	H	-	M

CO3	M	H	H	M	H	M	M	M	-	M
CO4	H	H	M	H	H	M	M	H	-	M
CO5	H	H	M	M	H	M	M	M	-	M

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Metallurgy: Basic Metallurgical operations - Concentration, Calcination, Roasting, Reduction and Refining. Extraction and uses of Ti, V and W. Platinum Metals – Metallurgy of Platinum. Platinum black, Platinised asbestos, colloidal platinum - Preparation and uses. Group Discussions: (i) Cr, Mo and W (ii) Fe, Co and Ni. Alloy steels. Heat treatment of steel. Iron and steel industry in India. Preparation and uses of the following compounds. TiO_2, TiCl_4, CrO_2Cl_2, ZrOCl_2, V_2O_5, FeSO_4 and $(\text{NH})_4\text{MoO}_4$. Alloys: Preparation, properties, composition and uses of some important alloys of Al, Ni, Sn and Pb.	19
Unit II	Fuels: Classification of fuels, calorific value and characteristics of good fuel. Gaseous Fuels: Advantages, Composition and uses of natural gas, water gas, producer gas, oil gas, LPG, CNG and Gobar gas. Liquid fuels: Petroleum-composition and classification. Refining of crude petroleum and uses of various fractions. Anti-Knocking agents, Octane and Cetane numbers. Synthetic Petrol – Catalytic Cracking of Petroleum. Fertilizers: Important nutrients and their functions. Primary and secondary nutrients. Manufacture of urea, ammonium sulphate, super phosphate of lime, triple super phosphate and calcium ammonium nitrate.	17
Unit III	Thermodynamics: Chemical potential -Gibbs – Duhem equation, variation of chemical potential with temperature and pressure. Chemical potential of ideal gases. Clapeyron-Clausius equation-application to various equilibria. Concept of fugacity physical significance of fugacity. Concept of activity and activity coefficient. Standard states. Chemical equilibrium: Law of mass action - relationship between K_p and K_c. van't Hoff's reaction isotherm and isochore. De-Donder's concept of chemical equilibria. Formation of HI, dissociation of PCl_5 and N_2O_4. Thermodynamic relations for chemical affinity. Le Chatelier's principle: Application to synthesis of ammonia.	18

Unit IV	Thermodynamics of Solutions: Types of solutions: Solution of liquids in liquids. Ideal solution. Raoult's law, Henry's law (Statement only). Non-ideal solution-deviation from Raoult's law. Duhem – Margules equation. Fractional distillation and azeotropes. Phase equilibria between condensed phases: Partially miscible liquid system-phenol-water triethylamine–water and nicotine–water system. Completely immiscible liquids: steam distillation. Nernst distribution law thermodynamic derivation, application to association of benzoic acid and study of $I_2 + I^- \rightleftharpoons I_3^-$.	18
Unit V	Colligative properties of solutions: Lowering of vapour pressure: Determination of lowering of vapour pressure by static method and dynamic method. Elevation of Boiling point: Definition, Calculation of molecular weight, Determination of elevation of boiling point by Cottrell's method. Depression of freezing point: Definition, Calculation of molecular weight, Determination of freezing point depression by Beckmann's method. Osmotic pressure: Laws of Osmotic pressure, van't Hoff's equation for osmotic pressure of dilute solution. Berkely and Hartley method of determination of osmotic pressure. Abnormal molecular weight and van't Hoff factor.	18
	Total Contact Hrs	90

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
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1	Mandeep Dalal	Textbook of Physical Chemistry	Volume 1. 1 st Edition. Dalal Institute	2018
2	Soni. P.L., Soni.	Text book of Inorganic Chemistry	20 th revised Edition. New Delhi: Sultan Chand & Sons.	2017
3	P.L. and Dharmarha. O.P.,	Text book of Physical Chemistry	23 rd revised Edition. New Delhi: Sultan Chand & Sons	2016
4	Moudgil. H.K.,	Text Book of Physical Chemistry.	2 nd Edition. New Delhi: PHI learning Pvt. Ltd	2015
5.	A.S.Negi and S.C. Anand	A Text Book of Physical Chemistry.	Reprint New Age International Publisher (P) Ltd.	2004

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Puri, Sharma and Pathania	Principles of Physical Chemistry.	47 th Edition. Jalandhar: Vishal Publishing Co.	2020
2	Puri and Sharma and Kalia. K.C.,	Principles of Inorganic Chemistry	33 rd Edition. Milestone Publishers and Distributors.	2016
3	Jain. P.C and Monika Jain,	Engineering Chemistry	17 th Edition. Dhanpat Rai Publishing Company (P) Ltd.	2015

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. M. Amutha	Name: Dr. Indumathy Ramasamy	Name: Mr. K. Srinivasan	Name: Dr. R. Manicka Chezian

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Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY3N1	Title	Batch:	2022 – 2025
		Non Major Elective - I	Semester:	III
Lecture Hrs./Week	1	Introduction to Nanotechnology	Credits:	2

Course Objective

To create basic awareness about Nanoscience and Technology and its current applications.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect the basics of nanoscience and nanomaterials	K1
CO2	Understand the various types of nanomaterials and the approaches towards the preparation of nanomaterials	K2
CO3	Sketch the specific properties of nanomaterials	K3
CO4	Illustrate the properties and uses of carbon nanomaterials	K3
CO5	Explain the applications of nanomaterials based on their properties	K3

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	-	-	-	-	-	-	L
CO2	H	H	H	-	-	-	-	-	-	L
CO3	H	H	H	-	-	-	-	-	-	L
CO4	H	H	H	-	-	-	-	M	-	L
CO5	H	H	H	-	-	-	-	M	-	L

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	General concepts in Nanotechnology – Nanotechnology – Definition, History of nanotechnology, Nature nanotechnology.	3
Unit II	Top-down approach and Bottom-up approach for the preparation of nanomaterials, Classification of nanostructures.	3
Unit III	Properties of Nanomaterials – High surface – volume ratio, Size dependent properties of nanomaterials.	3
Unit IV	Carbon Nanomaterials – Graphite, Graphene, SWCNT, MWCNT – Properties and uses.	3
Unit V	Applications of Nanomaterials – Energy Storage Devices, Nanosensors, Drug Delivery & Environmental Protection.	3
	Total Contact Hrs	15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

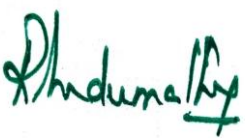
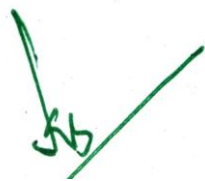
Test, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sulbha Kulkarni	Nanotechnology: Principles And Practice	3 rd Edn., Capital Publishing Company	2017
2	T. Pradeep	Nano: The Essentials: Understanding Nanoscience and Nanotechnology	McGraw Hill India.	2009
3	Daniel Ratner and Mark Ratner	Nanotechnology: A Gentle Introduction to the Next Big Idea	5 th Edn., Pearson.	2009

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	C.N.R. Rao, A. Muller, A. K. Cheetham	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	1stEdn (4thRepr), Wiley-VCH Verlag	2011
2	G. Cao	Nanostructures and nanomaterials: Synthesis, properties and applications	Imperial College Press.	2006
3	Qing Zhang	Carbon Nanotubes and Their Applications	CRC Press	2012
4	Rajendra Kumar Goyal	Nanomaterials and Nanocomposites: Synthesis, Properties, Characterization Techniques, and Applications	1stEdn., CRC Press	2020

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. N. Neelakandeswari 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY3N2	Title	Batch:	2022 – 2025
		Non Major Elective – I	Semester:	III
Lecture Hrs./Week	1	Chemistry of Consumer Products	Credits:	2

Course Objective

To acquire the basic knowledge in consumer product chemistry

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Label the ingredients present in consumer products	K1
CO2	Understand the action of soaps and detergents	K2
CO3	Demonstrate the formulation and uses of consumer products.	K3
CO4	Identify the required characteristics of cosmetics	K1
CO5	Describe the quality control and health hazards in cosmetics	K2

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	-	-	-	-	M	-	-
CO2	H	H	H	-	-	-	-	M	-	-
CO3	H	H	H	-	-	-	-	M	-	-
CO4	H	H	H	-	-	-	-	M	-	-
CO5	H	H	H	-	-	-	-	M	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
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Unit I	Soaps: Saponification of oils and fats. Manufacture of soaps. Formulation of toilet soaps. Different ingredients used and their functions. Mechanism of cleansing action of soap, Medicated soaps, Herbal soaps. Soft soaps, Shaving soaps and Creams.	3
Unit II	Detergents: Different ingredients in the formulation of detergent powders and soaps. Liquid detergents. AOS (alpha olefin sulphonates. cationic detergents: examples. Manufacture and applications. Non-ionic detergents: examples. Mechanism of action of detergents. Comparison of soaps and detergents.	3
Unit III	Cosmetics: Introduction and classification Face creams: cold cream, vanishing cream, cleansing and bleaching cream-ingredients, formulation and uses. Face powder: Requirements and ingredients. Hand cream: Formulations, Ingredients and uses. Nail preparations: Nail bleach, nail lacquers, nail lacquers and nail removers – requirements ingredients and formulations.	3
Unit IV	Make Up Preparations : Lipstick, Rouge, Mascara – characteristics and ingredients Dentifrices: Tooth paste and tooth powder -Essential and special ingredients and their functions.	3
Unit V	Hair preparations: Hair oils and hair tonics. Ingredients and their functions. Hair cream: Formulations. Shampoos: constituents and functions. Hair Dyes: Primary requirements of a dye. Vegetable colorings, metal salts and dye used in hairdyes. Hair removers: Temporary and permanent removal of hair. Quality control of cosmetics in India. Health hazards of cosmetics.	3
	Total Contact Hrs	15

*Italics denotes self study topics

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Swarnlata Saraf, Shailendra Saraf	Cosmetics: A Practical Manual	3 rd Edn., Bsp Books Pvt. Ltd.	2015
2	P. K. Chattopadhyay	Soaps, Detergents and Disinfectants Technology Handbook	2 nd Edn., NPCS Publication Division.	2019
3	Ajay Kumar Gupta	Soaps, Detergents and Disinfectants Technology Handbook	3 rd Edn., NIIR Project Consultancy Services.	2021

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Mitchell Schlossman	Chemistry and Manufacture of Cosmetics: Science	4 th Edn, Allured Pub Corp.	2008
2	B. K. Sharma	Industrial Chemistry	19 th Edn., Krishna Prakashan Media P. Ltd	2016
3	Amol A Kulkarni, Vikram Gharge, Indrajeet D Gonjari	Cosmetic Science	1 st Edn., Nirali Prakashan.	2017

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. N. Neelakandeswari	Name: Dr. Indumathy Ramasamy	Name: Mr. K. Srinivasan	Name: Dr. R. Manicka Chezian

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Programme Code:	B.Sc.			Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY405			Title	Batch:	2022 – 2025
				Core Paper – IV	Semester:	IV
Lecture Hrs./Week	6	Tutorial Hrs./Sem.	1	Core - IV : Inorganic, Organic and Physical Chemistry	Credits:	4

Course Objective

To explain the periodic properties of elements, various reactions and stereoisomerism of organic compounds phase rule, radioactivity and nuclear reactions

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect the properties of transition and inner transition elements	K1
CO2	Understand the preparation, properties and various reactions of phenols, aliphatic and aromatic nitro compounds	K2
CO3	Analyse the classification of amines, separation, basic nature and optical and geometrical isomerism of certain organic compounds.	K4
CO4	Apply the concepts of phase rule, phase equilibria and its applications to various systems.	K3

CO5	Explain the radioactivity, types of nuclear reactions and the applications of isotopes.	K2, K5
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Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	H	M	H	H	-	-
CO2	H	H	H	H	H	H	H	H	-	-
CO3	H	H	H	H	H	M	H	H	-	-
CO4	H	H	H	M	H	M	H	H	-	-
CO5	H	H	H	H	H	M	H	H	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Chemistry of d- and f-block elements: General comparison of 3d, 4d and 5d elements in term of electronic configuration, metallic nature, oxidation states, ionization energies, redox properties, formation of complexes, spectral and magnetic properties. f-block elements: electronic configuration, oxidation states, variation in atomic and ionic (3+) radii, lanthanide contraction and its consequence, magnetic and spectral properties of lanthanides, comparison between lanthanide and actinides, separation of lanthanides (by ion-exchange method). Extraction of Uranium from Pitch blende.	18
Unit II	Phenol: Preparation of phenol from aryl halide, cumene and grignard reagent. Reactions of Phenol: Nitration. sulphonation, halogenation, Kolbe's Schmidt reaction, Friedel Crafts reaction, Reimer Tiemann reaction, Lederer - Manasse reaction, Schotten – Bauman reaction and Gattermann aldehydes synthesis.	18

	Nitro Compounds: Aliphatic nitro compounds: Nitromethane and Nitroethane - preparation and properties. Nitro-Acinitro tautomerism. Aromatic nitro compounds: Preparation and reduction of Nitrobenzene in neutral, acidic and alkaline media and electrolytic reduction. Preparation of ortho, meta and paradinitrobenzenes and trinitrotoluene (TNT).	
Unit III	Amines: Aliphatic amines: separation of mixture of amines and basicity of amines. Aromatic amines: preparation and properties of Aniline. Reactions: Nitrous acid (HNO_2), diazotisation and coupling with mechanism. Conformational analysis of Ethane, n- Butane and Cyclohexane. Distinction between conformation and configuration. Stereoisomerism: Optical isomerism: Conditions, R-S configuration of priority rules with examples. optical isomerism in lactic acid and tartaric acid, racemisation, methods of resolution . Geometrical isomerism: cis and trans isomerism in maleic and fumaric acid and E-Z notation	18
Unit IV	Phase rule and phase equilibria: Concept of phase, components and degrees of freedom with examples. Thermodynamic derivation of Gibbs-Phase Rule. One component system: Phase diagram and discussion of water and sulphur system. Two component system: Construction of phase diagram by thermal analysis. Simple eutectic- Pb-Ag System. Formation of compounds with congruent melting point: Zn-Mg system. Formation of compounds with incongruent melting point: Na-K system. Salt-Water system: Potassium Iodide-Water system.	18
Unit V	Nuclear Chemistry: Radioactivity- types of radioactivity- types of radioactive rays -nuclear stability-n/p ratio - magic numbers- nuclear binding energy- mass defect- nuclear shell model - groups displacement law - decay constant – half- life period - radioactive equilibrium- transmutation-artificial transmutation- applications of artificial transmutation-radioactive series. Nuclear reactions types: fission and fusion reactions-principle and working of nuclear reactors. Isotopes: Separation of isotopes- identification of isotopes- isotopes of hydrogen-isotope effect- <i>Application of isotopes in chemistry, agriculture and medicine.</i>	18

	Total Contact Hrs	90
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Pedagogy: Direct Instruction, Digital Presentation and Flipped Class

Assessment Methods: Test, Seminar, Quiz, Assignments, Group Task.

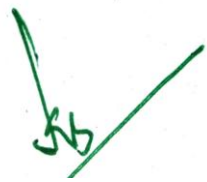
Text Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Arun Bahl. & Bahl B. S	A textbook of organic chemistry, 22nd edn.	Sultan Chand and Son Pvt. Ltd, New Delhi	2016
2	Puri, B. R. Sharma. L. R. & Kalia. K. C.	Principles of physical chemistry, 33rd edn.	Vishal Publishing House Pvt. Ltd, Jalandar.	2016
3	Soni, P. L.	Text book of organic chemistry, 29th edn.	Sultan Chand and Son Pvt. Ltd, New Delhi	2012
4	Madan, R. D.	Modern inorganic chemistry, 3rd edn.	Sultan Chand and Son Pvt. Ltd, New Delhi	2011

Reference Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Morrison Boyd & Bhattacharjee	Organic chemistry, 7th edn.	Pearson Education, Indian Branch, Noida	2011
2	Gardon, M. B.	Physical chemistry, 5th edn	McGraw Hill-Edition, Chennai	2010

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of Examination
Name with Signature	Name with Signature	Name with Signature	Name with Signature

Name : Dr. T.Gowrani 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 
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Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY406	Title	Batch:	2022 – 2025
		Core Practical –II Volumetric, Organic Qualitative Analysis and Organic Preparations	Semester:	IV
Practical Hrs/week	3		Credits:	5

Course Objective

To develop the analytical skills in volumetric, organic qualitative analysis and organic preparations to succeed at a entry-level position as analyst in industry.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the apparatus used in volumetric analysis	K1
CO2	Understand the titrimetric principle and procedure	K2
CO3	Get the idea about organic qualitative analysis	K3
CO4	Analyse the elements and functional groups of organic compounds.	K4
CO5	Prepare an organic compound following the prescribed procedure.	K5

Mapping with POs / PSOs Vs COs

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2

CO										
CO1	H	M	M	H	H	H	H	H	H	H
CO2	M	M	M	H	M	H	M	M	H	H
CO3	H	M	M	M	M	M	H	H	H	H
CO4	M	M	H	H	H	H	H	H	H	H
CO5	H	H	M	M	H	M	M	M	H	H

H – High; M – Medium; L – Low

Unit	Content	Hrs
	I) Volumetric Analysis a) Permanganometry: 1. Estimation of Ferrous ion. 2. Estimation of Oxalic acid. 3. Estimation of Sodium nitrite. b) Dichrometry: 1) Estimation of Ferrous ion using internal indicator. 2) Estimation of Ferric ion using external indicator c) Iodometry: 1) Estimation of Copper.(Demonstrationonly) 2) Estimation of Potassium dichromate. d) EDTA-Titrations: 1) Estimation of Calcium. 2) Estimation of Zinc. 3) Estimation of Magnesium. 4) Estimation of hardness of water-temporary andpermanent	

	Organic Qualitative Analysis Systematic qualitative analysis of organic compounds containing one functional group: Aldehydes, Ketones, Primary amines, Nitrocompounds, Amides, Anilides, Carbohydrates, Carboxylic acids and Phenols. Organic Preparations: 1) Acetylation of aniline to acetanilide. 2) Hydrolysis of benzamide to benzoic acid. 3) Hydrolysis of ester (ethylbenzoate to benzoic acid). 4) Nitration of acetanilide to p-nitroacetanilide. 5) Acetylation of Salicylic acid to acetyl salicylic acid.	
	Total hours/Semester	45

Pedagogy

Demonstration and individual hands on practical

Assessment Methods:

Performance of laboratory work, Report, Recording the report, Submission of the record.

Text Book

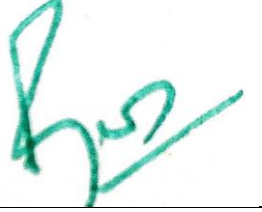
S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Venkateswaran. V., Veeraswamy. R and Kulandaivelu.A.R	Basic Principles of Practical Chemistry	2 nd Edition. New Delhi: S.Chand Publications.	2017

2	Gopalan. R, Balasubramaniam. P.S., and Rengarajan.K.,	Elements of Analytical Chemistry	New Delhi: Sultan Chand Publishers.	2013
3	Brian S. Furniss, Atony J. Hannaford, Peter W .G. Smith, Austin R. Tatchell.	Vogel's Text book of Practical Organic Chemistry.	Fifth edition. Longman group UK limited	1989

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ahluwalia.V.K.,SunithaDhingra, Adarsh Gulati	College Practical chemistry	First Edition. University press (India) Pvt.Ltd.	2012
2	Thomas, A.O	Practical Chemistry	Scientific Book Centre	2003
3	Gnanapragasam.N.S. Ramamurthy.G	Organic Chemistry Lab Manual.	S.Viswanathan Printers & Publishers Pvt Ltd	1996

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr.T.Gowrani 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian

			
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Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY4N1	Title	Batch:	2022 – 2025
		Non Major Elective - II Textile Chemistry	Semester:	IV
Lecture Hrs./Week	1		Credits:	2

Course Objective

To develop basic awareness in the area of Textile chemistry.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect the types of polymers, fibres and dyes	K1
CO2	Understand the morphology and properties of fibres	K2
CO3	Compare the natural and manmade fibres	K3
CO4	Classify dyes and dyeing processes	K3
CO5	Explain the nature of fibre and dye to attain a quality product	K3

Mapping with POs / PSOs Vs COs

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	-	-	-	-	-	-	-
CO2	H	H	H	-	-	-	-	-	-	-
CO3	H	H	H	-	-	-	-	-	-	-
CO4	H	H	H	-	-	-	-	-	-	-
CO5	H	H	H	-	-	-	-	-	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Polymers – Introduction, Types – Natural and Synthetic, Fibres – Definition, Morphology of fibres.	3
Unit II	Classification of fibres - Essential and desirable properties of textile fibres and their role in final products.	3
Unit III	Advantages and disadvantages of natural and manmade fibres. Processes involved in textile industry (Flow Chart).	3
Unit IV	Dyes – Classification - Natural and Synthetic Dyes, Dyeing of Cotton, Wool and Silk with natural dyes.	3
Unit V	Characteristics of Dye, Classification of Dyes based on the structure and mode of application	3
	Total Contact Hrs	15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Menachem Lewin,	The Handbook of Fiber Chemistry	3 rd Edn., CRC Press.	2006
2	HVS. Murthy	Introduction to Textile Fibres	1 st Edn., Nabu Press	2016
3	Padma S.Vankar,.	Natural Dyes for Textiles: Sources, Chemistry and Applications	1 st Edn., Cambridge Elsevier Science & Technology.	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Eva Lambert, Tracy Kendall	The Complete Guide to Natural Dyeing: Techniques and Recipes for Dyeing	1 st Edn., Interweave Press	2010
2	Harry Harper	Introduction to Textile Chemistry.	3 rd Edition. Vikas Publishing house.	2012

3	Robert R Mather, Roger H Wardman	The Chemistry of Textile Fibres,	2 nd Edn., Royal Society of Chemistry.	2015
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Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. N. Neelakandeswari 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc.	Programme Title:	Bachelor of Chemistry	
Course Code:	22UCY4N2	Title	Batch:	2022 – 2025
		Non Major Elective - II	Semester:	IV
Lecture Hrs./Week	1	Food Science and Technology	Credits:	2

Course Objective

To create an awareness on food and nutrition to non chemistry students.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the sources, functions of food , food preservation and adulteration	K1
CO2	Understand the metabolic activities, methods of food preservation, and effects and identification of food adulteration	K2
CO3	Illustrate the various food additives and adulterants	K3
CO4	Explain the types of adulteration and tests for detection	K2
CO5	Interpret the functions of food corporation of India, ISI and Agmark standards.	K3

Mapping with POs / PSOs Vs COs

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO										

CO1	H	H	H	-	-	-	-	M	-	-
CO2	H	H	H	-	-	-	-	-	-	-
CO3	H	H	H	-	-	-	-	-	-	-
CO4	H	H	H	-	-	-	-	-	-	-
CO5	H	H	H	-	-	-	-	M	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Food and Nutrition: Functions of food, food sources, energy value of foods, elementary idea about digestion and metabolism of Carbohydrates, Fats and Proteins.	3
Unit II	Food preservation: Importance of food preservation causes of food spoilage, principles of food preservation. Methods of food preservation - Bacterostatic Methods: Dehydration, Pickling and Salting Bactericidal Methods: Canning and Cooking.	3
Unit III	Milk Processing :Pasteurisation and milk products Food Additives: Antioxidants, Food Colours, Food enzymes, Spices and flavouring agents. Merits and demerits of additives and preservatives.	3
Unit IV	Food adulteration: Common adulterants and their effects. Intentional and incidental adulterants. Metallic contamination, contamination by pests and pesticide residues. Simple physical and chemical tests for detection of food adulterants.	3
Unit V	Packaging hazards: Food poisoning and food borne diseases. Food Laws: FSSAI Food Standard: ISI standards and the Agmark standards. Functions of Food Corporation of India.	3
	Total Contact Hrs	15

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Tejmeet Rekhi and Heena Yadav,	Fundamentals of Food and Nutrition	1 st Edn., Elite Publishing House.	2014
2	Sunil NathaMhaske	Essentials of Nutrition	1stEdn, CBS Publication	2015
3	Fellows P.J	Food Processing Technology: Principles and Practice	4 th Edn, Woodhead Publishing	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Bhavbhuti M. Mehta, Peter Chi Keung Cheung	Handbook of Food Chemistry	1stEdn.,Springer	2015
2	SunetraRoday	Food Science and Nutrition	3rdEdn., Oxford University Press	2018
3	Srilakshmi. B	Food Science	7thEdn, New Age International Publishers.	2018

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature

Name: Dr. N. Neelakandeswari 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 
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Programme code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	22UPS3A4/ 22UBY3A4/ 22UZY3A4	Title	Batch :	2022-2025
		Allied Chemistry Paper – I Inorganic, Organic and Physical Chemistry	Semester	III
Hrs/Week:	6		Credits:	4

Course Objective

To learn the chemistry of chemical bonding and co-ordination compounds. To understand basic principles of volumetric analysis and water treatment. To learn the chemistry of basic aromatic compounds. To know about some common diseases and the drugs used. To study about electrochemical conductance.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the principle of chemical bonding, coordination chemistry and applications of biologically important molecules.	K1,K2
CO2	Gain Knowledge on volumetric analysis and water treatment process	K2, K3
CO3	Sketch the synthesis of heterocyclic compounds and reactions of aromatic compounds and heterocycles.	K3

CO4	Explain pharmaceutical chemistry with some important drugs	K4
CO5	Know the basic principle of electro chemistry and corrosion	K4

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	M	H	M	M	M	M	M	H	-	-
CO2	M	H	M	M	M	M	M	M	-	-
CO3	M	H	H	M	M	M	M	M	-	-
CO4	M	H	H	M	M	M	M	H	-	-
CO5	M	H	H	M	M	M	M	H	-	-

High- H, Medium-M, Low-L

Unit	Content	Hrs
Unit I	Chemical bonding: Molecular orbital theory - bonding, anti-bonding and non-bonding orbitals, Application of Molecular orbital theory – MO configuration and bond order of H₂, N₂, O₂, F₂. VSEPR Theory – postulates, limitations and applications to BeCl₂, BCl₃, H₂O, NH₃, CH₄, PCl₅ and SF₆ molecules. Coordination Chemistry: Ligands–Mono and bidentate ligands; Coordination number. Nomenclature – Mononuclear complexes. Werner & Sidgwick Theories; Chelation and its industrial importance with reference to EDTA. Biological role of Haemoglobin and Chlorophyll. Applications in qualitative and quantitative analyses.	18

Unit II	Volumetric Analysis: Primary and Secondary standards. Principles of volumetric analysis. Preparation of normal, molal and molar solutions. Principle of acid - base titrations. Water treatment: Hardness of water. Temporary and permanent hardness. Units of hardness. Disadvantages of hard water in boiler. Softening of hard water – Zeolite process, reverse osmosis, electro dialysis and De-mineralization process – Purification of water for domestic use – Disinfection by Chlorine, Ozone and UV light.	18
Unit III	Aromatic compounds: Benzene - Resonance, Huckel's rule, resonance energy and structure, Electrophilic substitution in benzene. Mechanism of nitration, halogenation, alkylation, acylation and sulphonation. Heterocyclic compounds - Aromaticity of Heterocyclic compounds - Nomenclature of heterocyclic compounds- synthesis and reactions of furan- pyrrole- thiophene and pyridine.	18
Unit IV	Chemotherapy: Introduction, Sulphadrugs - sulphanilamide, sulphapyridine, sulphadiazine, sulphaacetamide and sulphathiazole. Mode of action- sulphanilamide Antimalarials: Classification and use of Chloroquine and Pamaquine. Antiseptics: Definition and uses of Chloramines –T, Iodoform and Dettol. Anaesthetics: Classification, characteristics and uses of procaine and pentothal sodium. Antibiotics: Introduction, use of Penicillin, Chloromycetin, Streptomycin and Tetracyclin. Vitamins: Classifications, occurrence and deficiency diseases caused by Vitamin A, B complex, C, D, E and K. (Note : Structure of the compounds is not required.)	18

Unit V	Electrochemistry: Electronic and electrolytic conductors – Faraday’s laws of electrolysis – Arrhenius theory of electrolytic dissociation- Transport number - Conductance: Specific and molar conductance, Variation of conductance with dilution. Kohlrausch law and its applications. Applications of conductance measurements – determination of degree of dissociation of weak electrolyte. Ionic product of water and conductometric titrations. pH: Definition, Buffer solutions, Importance of buffer in the living systems. Corrosion and its prevention.	18
	Total Contact Hrs/Semester	90

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

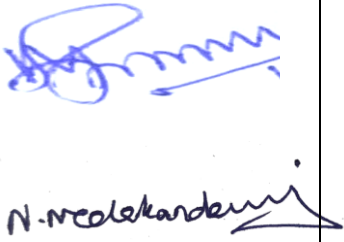
Text Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Vaidyanathan K., Venkateswaran A. and Ramasamy R	Allied chemistry	1. 1 st Edition. Priya publications.	2005
2	Veeraiyan., V. and Vasudevan, A.N.S	Ancillary chemistry	1 st Edition. Einstein publishing house	2001
3	Yadav, M.S, (2001), Electrochemistry	Electrochemistry	2 nd Edition. Anmol Publications	2001
4	Jayashree Ghosh	A Text book of Pharmaceutical Chemistry	New Delhi: S . Chand & Co.,	2009

Reference Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	B. R. Puri, L. R. Sharma and K. C. Kalia	Principles of Inorganic Chemistry	33rd Edition. Vishal Publishing Co.,	2020
2	2. Jain P.C. and Monica Jain	Engineering Chemistry	17 th Edition. Dhanpat Rai Publishing Company(P)Ltd.	2007
3	P. L. Soni	Text Book of Inorganic Chemistry	Sultan Chand & Sons	2013
4	Arun Bahl and B.S. Bahl	Advanced Organic Chemistry	5th Edition. S Chand	2012
5	M.K. Jain and S. C. Sharma	Modern Organic Chemistry	Golden Jubilee Year Vishal	2020

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms. R. Sudha Dr. M. Selladurai Dr. N. Neelakandeswari 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

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Programme Code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	22UPS4A5/ 22UBY4A5/ 22UZY4A5	Title	Batch :	2022-2025
		Allied Chemistry Paper – II Inorganic, Organic and Physical Chemistry	Semester	IV
Hrs/Week:	6		Credits:	4

Course Objective

To study about fuels, fertilizers, cement and glass. To learn about the importance of dyes and polymer science. To know about carbohydrates, amino acids, proteins and nucleic acid. To understand the different kinds of colloids and catalysis.

Course Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and apply the basics of fuel, fertilizers, glass and cement	K2, K3
CO2	Recognize the basic ideas on synthetic dyes and synthetic polymers.	K1
CO3	Demonstrate the chemistry of amino acids and proteins.	K3
CO4	Illustrate the carbohydrates, their types and properties	K3
CO5	Explain colloids, catalysis and phase rule	K4

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	M	H	-	-
CO2	H	H	H	M	M	M	H	H	-	-
CO3	H	H	H	M	M	M	M	M	-	-
CO4	H	H	H	M	M	M	M	M	-	-
CO5	H	H	H	M	M	M	M	H	-	-

High- H, Medium-M, Low-L

Unit	Content	Hrs
Unit I	Fuels: Types of fuels. Characteristics of a good fuel. Calorific value of a fuel. Determination of calorific value of solid fuel using Bomb calorimeter. Advantages of gaseous fuels. Natural gas, water gas, producer gas, oil gas, LPG and Gobar gas – Composition and uses (manufacturing details not needed) Fertilizers: Manufacture of urea, ammonium sulphate, super phosphate of lime, Triple super phosphate and potassiumnitrate. Glass: Manufacture, types of glass – soft glass, hard glass, flint glass, Pyrex glass and Coloured glass. Cement: Manufacturing – Wet Process and Dry process- types-setting of cement – role of gypsum.	18
Unit II	Synthetic Dyes: Definition, classification based on structure and application. Colour and constitution – Chromophore – Auxochrome Theory. Synthesis and uses of the following dyes: Azo dyes – methyl orange Vat dyes – Indigo (from anthranillic acid) Anthraquinone dyes (Alizarin) Phthalein dyes – Phenolphthalein. Synthetic Polymers: Classification – Homo and copolymers – Natural, Synthetic, organic, Inorganic polymers. Thermo plastics and thermosetting plastics. Types of polymerization. PVC, Polystyrene, Bakelite, Teflon, Polyester, Nylon-6.6, Buna-S rubber – Preparation and uses.	18

Unit III	Amino acids and Protein: Classification of amino acids. Preparation and properties of Glycine. Action of heat on amino acids. Peptides. Synthesis of glycylalanine by carbobenzoxy method. Proteins: Classification, simple and conjugated proteins. Denaturation and colour reactions of proteins. Primary and secondary structure. Biological functions. Nucleosides - Nucleotides - RNA and DNA – structure.	18
Unit IV	Carbohydrates: Classification – preparation and properties of Glucose and Fructose. Elucidation of structure of Glucose and fructose. Comparison of properties of Glucose and fructose. Conversion of Glucose to Fructose and Fructose to Glucose. Sucrose: Preparation, properties and structure (Elucidation of structure not necessary) Starch and Cellulose: Properties and uses (Elucidation of structure not necessary).	18
Unit V	Colloidal solution: Types of colloids. Preparation and properties of colloids and applications. Catalysis: Characteristics, types, mechanism of catalytic action and Industrial application, Catalytic poisoning. Phase rule- Definition of terms involved. Phase diagram of H₂O, Pb-Ag .	18
	Total contact Hrs/Semester	90

Pedagogy: Direct Instruction, Digital Presentation, Flipped Class

Assessment Methods: Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Vaidyanathan K., Venkateswaran A. and Ramasamy R.,	Allied chemistry	1 st Edition. Priya publications.	2005
2	B S Bahl and Arun Bahl	Advanced Organic Chemistry	5th Edition. S Chand	2012

3	Monika Jain P. C. Jain,	Engineering chemistry	17th Edition. Dhanpat Rai Publishing Company (P) Ltd.,	2019
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Reference Books

S.No.	Author	Title of the Book	Publishers \ Edition	Year of Publication
1	Tyagi O.D., Yadav M	A Text Book of Synthetic Dyes.	1 st Edition. Anmol publications Pvt. Ltd.,	2002
2	Soni, P.L	Text book of Organic Chemistry	29 th edition. Sultan Chand & Sons	2012
3	Lubs, H.A	Chemistry of Synthetic Dyes and Pigments	1 st Edition. Robert E. Krieger publishing company.	1995

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms. R. Sudha Dr. M. Selladurai Dr. N. Neelakandeswari   	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme code:	B.Sc.	Programme Title :	Bachelor of Chemistry	
Course Code:	22UPS 4A6/ 22UBY4A6/ 22UZY4A6	Title	Batch :	2022-2025
		Allied Chemistry Practical	Semester	III & IV
Hrs/Week:	2		Credits:	2

Course Objective

To understand the principles of volumetric analysis. To enable the students to have hands-on training on qualitative analysis of organic compounds.

Course Outcome

On the successful completion of the course, students will be able

CO Number	CO Statement	Knowledge Level
CO1	Learn how to conduct a volumetric estimation process precisely.	K1,K2
CO2	Understand reactions taking place during the experiment.	K2, K5
CO3	Get the idea about organic qualitative analysis	K2, K4
CO4	Distinguish between aliphatic and aromatic, saturated and unsaturated compounds.	K3
CO5	Evaluate the reactivity of various functional groups	K2, K5

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	M	H	H	H
CO2	H	H	H	H	M	H	M	H	H	H
CO3	H	H	H	H	M	H	M	H	H	H

CO4	H	H	H	H	M	H	M	H	H	M
CO5	H	H	H	H	H	H	M	H	H	H

High- H, Medium-M, Low-L

Unit	Contents	Hours
	Volumetric Analysis: 1. Estimation of sodium carbonate. 2. Estimation of oxalic acid(Acidimetry) 3. Estimation of ferrous ion. 4. Estimation of ferrous sulphate. 5. Estimation of oxalic acid.(Permanganometry) 6. Estimation of potassium dichromate using sodium thiosulphate 7. Estimation of temporary, permanent and total hardness of water 8. Estimation of Zinc using EDTA. 9. Estimation of Mg using EDTA. Organic analysis: Detection of elements. Nitrogen, Sulphur and Halogens. 1. To distinguish between aliphatic and aromatic, saturated and unsaturated compounds. 2. Functional group tests for : i) Mono and Dicarboxylic acids ii) Phenols iii) Carbohydrates(Reducing and non reducing) iv) Aromatic primary amines and v) Amides.	
	Total contact Hrs/Semester	30

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	A.I. Vogel	Elementary practical organic chemistry- qualitative organic analysis part 2.	2 nd Edition. Prentice Hall.	2014
2	V. Venkateswaran, R. Veeraswamy, A. R. Kulandaivelu	Basic Principles of Practical Chemistry.	2 nd Edition. New Delhi: Sultan Chand & Sons	2012
3	F. G. Mann. & B. C. Saunders	Practical Organic Chemistry.	4 th Edition. Pearson Education India	2009

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Pandey O. P, Bajpai D. N., Giri	Practical Chemistry.	S.Chand & Co.	2010
2	G. Svehla	Vogel's Qualitative Inorganic Analysis.	Dorling Kindersley. 7 th Edition.	2009
3	A.O. Thomas	Practical Chemistry.	Scientific Book Centre, Cannanore,	2003

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
	124		

Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Ms. R. Sudha Dr. M. Selladurai Dr. N. Neelakandeswari 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

2023 - BATCH

I & II - SEMESTERS

Programme Code:	B.Sc			Programme Title:	Bachelor of Chemistry	
Course Code:	23UCY101			Title	Batch:	2023 – 2026
				CC I :	Semester:	I
Lecture Hrs./Week	6	Tutorial Hrs./Sem.	1	Inorganic and Organic Chemistry	Credits:	5

Course Objective

To understand basic theoretical concepts on chemical bonding and hybridization, acquire knowledge on aromaticity, mechanistic pathway of aliphatic nucleophilic substitutions and aromatic electrophilic substitutions in organic reactions.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recollect the types of chemical bonding	K1,K2
CO2	Deduce the geometry of the molecules and apply MOT to Homonuclear and Heteronuclear molecules and understand the basic theoretical concepts in inorganic qualitative analysis.	K2, K3
CO3	Write the nomenclature of organic compounds and analyze the reactions of alkenes and examine the relevant name reaction	K2, K4
CO4	Apply the concepts in determining the mechanisms of aliphatic nucleophilic substitution reactions	K3
CO5	Interpret the factors affecting in determining the orientation and reactivity of the aromatic compounds	K2, K5

Mapping with PO / PSO Vs CO

PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO					126					

CO1	H	H	H	M	M	M	M	M	-	-
CO2	H	H	H	M	M	M	H	H	-	-
CO3	H	H	H	H	M	H	M	M	-	-
CO4	H	H	H	M	M	M	M	M	-	-
CO5	H	H	H	M	M	M	M	M	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Periodic Properties and Theory of Bonding: Long form of Periodic Table - Main features, advantages and defects. Division of elements into s, p, d and f block elements. Periodic properties of elements. Chemical bonding: Variable electrovalency - Pseudo inert gas configuration-Inert pair effect. Ionic Bonding - Conditions for the formation of an ionic compound, Characteristics of Ionic compounds. Crystal lattice energy and its determination by Born-Haber Cycle. Covalent Bonding: Lewis – Langmuir concept and Octet rule, Characteristics of covalent compounds- Polarizing power and Polarizability. Partial ionic character in covalent bond. Fajan's rules and their applications in explaining melting points and solubility properties. Co-ordinate covalent bonding: Characteristics. Comparison between ionic, covalent and coordinate bonding. Hydrogen bonding-concept, types and applications - melting and boiling points of hydrides of nitrogen, Oxygen, Fluoride and Lesser density of ice. Intermolecular forces – London forces and van der Waals forces – ion dipole-dipole interactions.	20
Unit II	Molecular Orbital Theory: Concept of Hybridization- sp, sp² and sp³ with reference to C₂H₂, C₂H₄, CH₄ and C₆H₆ molecules. Applications of VSEPR Theory to BeCl₂, BCl₃, H₂O, NH₃, CH₄, PCl₅ and SF₆ molecules. Molecular Orbital Theory: Symmetry of molecular orbitals. Application to simple Homonuclear and Heteronuclear molecules - H₂, He₂, O₂, F₂, N₂, CO and NO. Bond order and magnetic properties. Theoretical Principles in Qualitative Analysis: Basic principles involved in analysis of cations and anions, solubility products, common ion effect.	18

	Principles involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.	
Unit III	Polar Effects and Reactions of Alkanes, Alkenes: Nomenclature of organic compounds - IUPAC naming of simple and substituted aliphatic, aromatic and alicyclic compounds - priorities of functional groups in polyfunctional compounds. Polar Effects: Inductive, mesomeric, electromeric and hyperconjugative effects. Steric inhibition of resonance Homolytic and Heterolytic fission: Free radicals, carbocation, carbanion and their stability. Electrophiles and nucleophiles with examples. Alkanes: Structure – source – Methods of preparation and properties. Alkenes: Preparations involving dehydrohalogenation, dehydration, reduction of alkynes and Wittig reaction. Mechanism of Elimination reactions: E1 and E2 .Saytzeff and Hofmann rules. Reactions of Alkenes: Addition of hydrogen halide, Markovnikov rule, peroxide effect, hypohalous acid, sulphuric acid, hydroboration. Oxidation by alkaline KMnO_4 and Ozonolysis.	18
Unit IV	Reactions of Dienes and Alkynes: Dienes-Nomenclature, Classification and stability. 1,2 and 1,4 addition of Butadiene. Diels-Alder reaction. Alkynes: Preparation of alkynes by dehydrohalogenation, dehalogenation and electrolysis. Reactions: Hydroboration, addition of hydrogen halides, water, formation of acetylides and Ozonolysis. Grignard reagent - Preparation and synthetic utility of Ethyl magnesium iodide. Aliphatic Nucleophilic Substitution: S_N^1 and S_N^2 mechanisms. Effect of structure of substrate, nucleophile and solvent.	18
Unit V	Electrophilic Substitution: Benzene: Resonance, Resonance energy and structure. Aromaticity: Huckel's rule. Non-benzenoid aromatic compound – Annulene, Cyclopropenyl cation, cyclopentadienyl anion and Tropylium cation. Aromatic Electrophilic Substitution: Arenium ion mechanism, mechanism of nitration, sulphonation, halogenation, Friedel-Crafts alkylation and acylation in benzene. Orientation and reactivity of Monosubstituted benzene: ortho, para and meta directing. Role of inductive and mesomeric effects in electrophilic aromatic substitution in phenol and	16

	nitrobenzene.	
	Total Contact Hrs	90

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1	Soni. P.L	Text book of Inorganic Chemistry	Sultan Chand & Sons, New Delhi	2012
2	Bahl.B.S. and Arun Bahl	Advanced Organic Chemistry	S.Chand & Company Ltd., New Delhi	2009
3	Soni. P.L.	Text book of Organic Chemistry	Sultan Chand & Sons, New Delhi	2012
4	Madan. R.D.	Advanced Inorganic Chemistry	S.Chand & Company Ltd., New Delhi	2011

Reference Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1	Finar I.L.	Organic Chemistry	Longmans	2006
2	Morrison. R.T. and	Organic Chemistry	7 th Edition. Pearson Hall 129 Prentice.	2011

	Boyd. R.N.			
3	Wahid U.Malik, G.D, Tuli, and Madan. R.D.	Selected Topics in Inorganic Chemistry	S.Chand & Company, New Delhi	2006

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. T.Gowrani 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc			Programme Title:	Bachelor of Chemistry	
Course Code:	23UCY202			Title	Batch:	2023 – 2026
				CC II :	Semester:	II
Lecture Hrs./Week	5	Tutorial Hrs./Sem.	1	Organic and Physical Chemistry	Credits:	4

Course Objective

To acquire knowledge on the mechanisms of reactions in carbonyl compounds, understand basics concepts on quantum chemistry and important laws of thermodynamics.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Discuss the preparation, properties of alcohols, dicarboxylic acids, hydroxy acids and esters	K2
CO2	Analyse the reactions of aldehydes / ketones and examine the relevant reactions and understand the basic principles involved in volumetric analysis	K4, K3
CO3	Apply quantum chemical treatment to sub-atomic particles of atom	K3
CO4	State and apply first law of thermodynamics, perform calculations for physical process	K3, K4
CO5	Analyse the feasibility of the reaction	K4

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	M	M	M	M	H	-	-
CO2	H	H	H	M	M	H	H	H	H	-
CO3	H	H	H	M	M	M	M	M	-	-
CO4	H	M	H	M	M	M	M	M	-	-
CO5	H	H	H	M	M	M	M	H	-	-

H – High; M – Medium; L – Low

Units	Content	Hrs
Unit I	Alcohols: General methods of Preparation and its chemical properties. Distinction among primary, secondary and tertiary alcohols. Ethers: General methods of preparation and its chemical properties. Preparation and properties of diethyl ether. Dicarboxylic acids: Preparation and properties of oxalic, malonic, succinic and phthalicacids. Hydroxy acids: Tartaric acid, citric acid - Preparation and properties. Acetoacetic ester: Preparation and its applications in the synthesis of acetone, adipic acid, crotonic acid and 4-methyl uracil. Keto-enol tautomerism. Malonic ester: Preparation and its applications in the synthesis of crotonic acid, barbutric acid, succinic acid and dimethyl acetic acid. Acid derivatives: Acetyl chloride and acetic anhydride- Preparation, properties and uses. Manufacture of ethanol from molasses. Absolute alcohol, methylated spirit and power alcohol.	15

Unit II	Carbonyl compounds: Preparation by Rosenmund reduction, Stephen reaction and dry distillation of calcium salts of fatty acids. Mechanism of Nucleophilic addition reaction in aldehydes and ketones: Addition of Grignard reagent, HCN, NaHSO₃ and NH₃. Addition with NH₂-NH₂, C₆H₅NHNH₂ and ROH. Mechanism of Aldol, Perkin, Benzoin condensation, Cannizzaro, Reimer-Tiemann, Gattermann and Reformatsky reactions. Reduction: Wolff-Kishner, Clemmensen, MPV reductions. Reduction with reagents: Lithium Aluminium Hydride and Sodium Borohydride. Oxidation of aldehydes and ketones using Tollen's reagent, Fehling's solution, SeO₂ and Oppenauer oxidation. Volumetric analysis: Principle, Preparation of standard solutions, primary and secondary standard substances, Types of titration and Principles of different types of titrations – Acid base titration (Strong acid – strong base, weak acid – strong base only), Precipitation titration, complexometric titration and redox titration).	15
Unit III	Quantum Theory: Black body radiation - Limitations of classical theory. Planck's radiation theory, Quantisation of energy. Einstein's theory of Photoelectric effect. Rutherford atomic model- Bohr theory of hydrogen atom -Sommerfield theory - Particle and wave character of electrons. De-Broglie's equation. Davison and Germer experiment. Heisenberg's uncertainty principle - Compton effect. Schrodinger wave equation (Equation only/ Derivation not required). Applications to particle in one-dimensional box, Orbit and Orbitals, significance of Ψ and Ψ^2	15
Unit IV	Thermodynamics: Importance and Thermodynamic terms. Types of Thermodynamic equilibrium and processes. First law of Thermodynamics: Law of conservation of energy, internal energy. Enthalpy and Heat capacity: Relation between Cp and Cv. Work done in an isothermal reversible expansion of an ideal gas. Reversible adiabatic expansion of an ideal gas: Relation between temperature and volume and temperature and pressure. Comparison of isothermal and adiabatic expansions. Joule-Thomson Experiment: Joule-Thomson Effect, Joule – Thomson coefficient for an ideal gas, Inversion Temperature. Zeroth law of thermodynamics. Absolute zero of temperature.	15

Unit V	Thermochemistry: Definition – Standard Enthalpy of formation and Enthalpy of neutralization. Hess's law, Measurement of enthalpy of reactions by Bomb Calorimeter. Bond energy and its applications. Second law of thermodynamics: Limitations of First law. Need for Second law of thermodynamics. Various statements of Second law of thermodynamics. Entropy: Definition, Entropy changes in reversible and irreversible spontaneous processes. Entropy change accompanying change of phase, isothermal expansion of an ideal gas with change in pressure, volume and temperature. Entropy of mixing of ideal gases. Carnot's cycle, Physical significance of entropy. Helmholtz and Gibbs free energy functions: Variation of free energy with temperature or pressure, Gibbs Helmholtz equation. Third law of Thermodynamics (statement only).	15
	Total Contact Hrs	75

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Test, Seminar, Quiz, Assignments, Group Task.

Text Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1.	Soni. P.L	Text book of Inorganic Chemistry	Sultan Chand & Sons, New Delhi	2012
2.	Bahl.B.S. and Arun Bahl	Advanced Organic Chemistry	S.Chand & Company Ltd., New Delhi	2016
3.	Puri B.R., Sharma L.R. and Pathania M. S.	Principles of Physical Chemistry	Vishal Publishing House. 134	2018

4.	Negi. A.S., and Anand S.C.	A text book of Physical chemistry	New Age International PVT Ltd	2009
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Reference Books

S.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER/EDITION	YEAR OF PUBLICATION
1	Finar I.L.	Organic Chemistry.Vol.I and II	Pearson Education: Singapore	2003
2	Morrison. R.T. and Boyd. R.N.	Organic Chemistry	17 th Edition. Pearson Hall Prentice.	2011
3	Soni. P.L. and Dharmarha O.P.	Text book of Physical Chemistry	S.Chand & Company, New Delhi	2005

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. N. Neelakandeswari 	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Programme Code:	B.Sc	Programme Title:	Bachelor of Chemistry	
Course Code:	23UCY203	Title	Batch:	2023–2026
		CC Lab – I: Inorganic Qualitative Analysis	Semester:	II
Lecture Hrs./Week	3		Credits:	3

Course Objective

To know about the skills of using glassware's and apparatus used in qualitative analysis, develop the analytical skills in inorganic qualitative analysis and know the chemistry principles applied in qualitative analysis.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the procedure for the analysis	K1, K2
CO2	Understand and apply the theoretical knowledge to chemical reactions responsible for the reactions leading to identification of the given radicals	K2, K3
CO3	Separate the cations into groups and to identify them	K1, K4
CO4	apply the theoretical knowledge in the preparation of inorganic metal complexes	K3

Mapping with PO / PSO Vs CO

PO / PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	H	H	H	H	H	H	M	M	H	M
CO2	H	H	H	H	H	H	M	M	H	M
CO3	H	H	H	H	H	H	M	M	H	M
CO4	H	H	H	H	H	H	M	M	H	M

H – High; M – Medium; L – Low

Units	Content	Hrs
	1. Inorganic mixture analysis: Analysis of mixture containing two anions one of which is interfering in nature and two cations: The following radicals may be given-: Carbonate, Nitrate, Fluoride, Sulphate, Chloride, Oxalate, Phosphate, Borate, Lead, Copper, Nickel, Bismuth, Cadmium, Manganese, Zinc, Calcium, Strontium, Barium, Magnesium and Ammonium. 2. Inorganic Preparations i) Preparation of Tetrammine copper (II) complex. ii) Preparation of Hexammine cobalt (II) Chloride. iii) Preparation of Potassium trioxalato chromate (III).	
	Total Contact Hrs	45

Pedagogy

Demonstration and individual hands on practical.

Assessment Methods

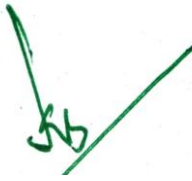
Performance of laboratory work, Report, Recording the report, Submission of the record

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Venkateswaran,V.,Veeraswamy. R and Kulandaivelu. A.R	Basic Principles of Practical Chemistry	S.Chand Publications.	2004
2	Svehla G. and Sivasankari.B	Vogel's Qualitative Inorganic Analysis	7 th Edn.Pearson India education services.	2012

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Thomas, A.O	Practical Chemistry	Cannanore: Scientific Book Center	2003
2	RamanujamV.V.	Inorganic semi micro qualitative analysis	3 rd Edn.The National Publishing Co.	2004

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Name: Dr. Indumathy Ramasamy	Name: Dr. Indumathy Ramasamy 	Name: Mr. K. Srinivasan 	Name: Dr. R. Manicka Chezian 

Pharmacology			
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