Semester – II
Major Core – II: GENERAL CHEMISTRY - II
Course Code: CC2021

Hours Per week	Credits	Total Hours	Marks
4	4	60	100

Objectives

1. To learn the preparation, properties and importance of aliphatic hydrocarbons and alicyclic compounds.
2. To understand the principles and theories of chemical bonding metallurgical processes.
3. To study the gas laws , physical properties of liquids and the classification of liquid crystals

Course Outcome

COs	*Upon completion of this course, students will be able to*	PSO Addressed	Cognitive Level
CO - 1	understand the preparation, properties of organic compounds	PSO-1	U
CO - 2	apply the theories in the preparation of compounds	PSO-6	A
CO - 3	prepare and evaluate compounds based on their application and structure	PSO-4	E
CO - 4	predict the properties of elements and the principles of volumetric analysis	PSO-6	Y
CO - 5	analyse the properties of matter	PSO-2	Y
CO - 6	learn the basics of metallurgy and the theories about gases	PSO-1	U

Total Number of Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Aliphatic Compounds**					
	1	Alkanes - preparation, physical properties, reactions, reactions with radical mechanism for substitution reaction	3	Understand the preparation and properties of alkanes	Lecture and discussion	Evaluation through Multiple choice questions, short test, quiz and class test
	2	Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes	3	Know about alkenes and the reactions	Lecture and discussion	

	3	Hydroboration, hydroxylation, ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by KMnO4 and polymerization	2	Gain knowledge about the reactions of alkenes	Lecture	Formative assessment I
	4	Synthesis of - Dibenzyl, cis and trans 2-butene, propanal and 1-methyl cyclohexanol	2	Prepare various compounds from alkenes	Lecture	
	5	Akynes: preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH_3COOH - dimerisation and cyclisation - acidity of terminal alkynes	2	Understand the preparation and properties of alkynes	Question answer session and lecture	
II	**Alicyclic Compounds**					
	1	Cycloalkanes: Preparation - reactions -cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid	3	Know about preparation and reactions of cycloalkanes	Lecture with power point presentation	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Wurtz reaction -stability of cycloalkanes - Baeyer's strain theory. Cycloalkenes: Preparation and reactions	3	Know the stability of cycloalkanes	Lecture with illustration	
	3	Preparation of conjugate dienes - reactions - 1,2 and 1,4 addition and Diels-Alder reaction, Synthesis of trans 2-chloro cyclopentanol	3	Understand clearly about the reactions and synthesis of compounds	Lecture, Discussion	
	4	Synthesis trans-2 methylcyclopentanol, cis and trans 1,2cyclohexanediol, cyclohexene, 2,3-butanedione and adipic acid	2	Study the synthesis of compounds	Lecture, Discussion	

III	**Chemical bonding**					
	1	Ionic bond - Properties of ionic compounds, factors favoring the ionic bond formation - ionization potential - electron affinity - electronegativity - Lattice energy - Born-Haber Cycle - Polarizing power and Polarizability	3	Understand clearly about ionic bond and lattice energy	Lecture with illustration	Evaluation through Multiple choice questions, short test, quiz Formative assessment II
	2	Transition from ionic to covalent character and vice versa - Fajan's rules - Covalent bond - Properties of covalent compounds - structure and bonding of homo and heteronuclear molecules	3	Learn covalent bonding	Lecture with illustration	
	3	Hydrogen bonding - types, effect on properties - Hybridisation - sp^3,sp^2, sp,dsp^2,d^2sp^3,d^3sp^3- Examples - $BeCl_2$, BF_3, $SiCl_4$, PCl_5, SF_6, IF_7,H_2O, NH_3, XeF_6	3	Analyze the effects of hydrogen bonding and types of hybridization	Lecture	
	4	VSEPR Theory – Postulates – MO Theory – Bonding and anti-bonding orbitals – Applications of MO theory H_2, He, N_2, O_2, HF and CO molecules – Comparison of VB and MO theories	3	Know about VSEPR and MO theories	Lecture with power point presentation and illustration	
IV	**Metallurgy**					
	1	Occurrence of metals – basic metallurgical operations and metallurgy process – General methods involved in extraction of metals	2	Know about various metallurgical processes	Lecture	Evaluation through Multiple choice questions, short test, quiz Formative assessment II
	2	Concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process	1	Understand about different concentration methods	Lecture and discussion	
	3	Extraction processes– Chemical reduction – electrolytic reduction – metal displacement	2	Acquire knowledge about extraction processes	Lecture	

	4	Refining methods - distillation - fractional crystallization - electrolysis. Zone refining van Arkel de Boer methods	1	Know about various refining methods	Lecture and discussion	
	5	Electrolytic refining - ion exchange method - extraction - chemical properties and uses of Ti, W, Mo, V, and Ni	4	Study the extraction and properties of different metals	Lecture with power point presentation	
V	**Gas and Liquid state**					
	1	Ideal gas: Kinetic theory of gases - Postulates and derivation of kinetic gas equation, derivation of gas laws-Maxwell's distribution of molecular velocities	3	Know about the theory of gases and derivation of gas equation	Lecture and discussion	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Types of molecular velocities - collision diameter - collision frequency - mean free path	2	Know about molecular velocities	Lecture	
	3	Degrees of freedom - translational, rotational and vibrational - Principle of equipartition of energy - Behaviour of real gas - Vander Waals equation of state - derivation	3	Understand the different degrees of freedom and behaviour of real gases	Lecture with Illustration	
	4	Liquid state: Physical properties - Trouton's rule - surface tension - Effect of temperature on surface tension - viscocity - effect of pressure and temperature - refraction - refractive index - specific and molar refraction	2	Learn about liquid state	Lecture and discussion	
	5	Liquid crystals: Vapour pressure temperature diagram – thermography – classification of thermotropic liquid crystals – nematic, smetic and cholesteric liquid crystals with examples.	2	Know about different types of liquid crystals.	Lecture and discussion	

Course Instructor: Ms. L. Deva Vijila HOD: Dr. G. Leema Rose

Allied Chemistry - Botany and Zoology Major
Chemistry of Biomolecules
Course Code: CA2021

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
4	**3**	**60**	**100**

Objectives:

1. To acquire knowledge about the chemistry of biomolecules
2. To understand the structure and functions of biomolecules

Course Outcome

COs	*Upon completion of this course, students will be able to*	PSO Addressed	Cognitive Level
CO-1	remember the classification of biomolecules	PSO-1	R
CO-2	understand the structure, function and metabolism of biomolecules	PSO-1	U
CO-3	apply the chemistry of biomolecules in industry and medicine	PSO-6	A
CO-4	analyse and identify biomolecules	PSO-2	Y

Total Number of Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topics	Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Carbohydrates**					
	1	Introduction - sources of carbohydrates in the diet - classification and functions	2	Understand the sources, classification and functions of carbohydrates in the diet	Lecture with illustration	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Glucose and fructose - reactions - interconversions and mutarotation	1	Gather knowledge on the reaction interconversions and mutarotation of glucose and fructose	Lecture and discussion	
	3	Tests for carbohydrates - Molisch's, Benedict and Fehlings tests	1	Know the tests for carbohydrates	Lecture with power point presentation	
	4	Digestion - absorption - metabolism of carbohydrates	3	Understand the metabolism of carbohydrates.	Lecture and discussion	
	5	Regulation of blood sugar - diabetes mellitus	1	Study the regulation of blood sugar	Lecture and discussion	

	6	Properties and uses of sucrose, starch and cellulose	2	Know the properties and uses of sucrose, starch and cellulose.	Lecture with power point discussion	
	7	Differences between starch and cellulose	2	Differentiate between starch and cellulose	Lecture with power point discussion	
II	**Amino Acids and Proteins**					
	1	Amino acids - classification - isolation from proteins - Zwitter ion formation and isoelectric point	2	Understand the classification of amino acids	Lecture and discussion	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Synthesis of glycine, alanine and phenyl alanine	2	Study the synthesis of amino acids	Lecture and discussion	
	3	Peptides - peptide bond - synthesis of dipeptides	2	Know the synthesis of peptides	Lecture with power point discussion	
	4	Proteins - classification based on structure and functions	2	Study the classification of proteins	Lecture with power point discussion	
	5	Primary, secondary, tertiary and quaternary structure of proteins	2	Acquire knowledge on structure of proteins.	Lecture and discussion	
	6	Denaturation of proteins - Tests for proteins - Ninhydrin and biuret tests	2	Understand denaturation of proteins	Lecture with power point discussion	
III	**Nucleic Acids and Enzymes**					
	1	Nucleic acids - nucleosides and nucleotides. Structure of DNA - denaturation and renaturation of DNA - replication of DNA	3	Know the structure of DNA	Lecture and discussion	Evaluation through Multiple choice questions, short test, quiz Formative assessment II
	2	Hydrogen bonding in DNA. Stabilizing forces in protein and DNA -Vander waal's forces, dipole-dipole and dipole-induced dipole interactions	2	Study the bonding in DNA molecules	Lecture with power point discussion	
	3	Structure of RNA - Types of RNA. Difference between DNA and RNA	2	Acquire knowledge on structure of RNA	Lecture with power point discussion	

	4	Enzymes - classification and characteristics - Mechanism of enzyme action -factors influencing enzyme activity	2	Understand the classification of enzymes	Lecture and discussion	
	5	Cofactors and coenzymes. Enzyme inhibitors - reversible and non-reversible inhibitors	2	Know the importance of cofactors and coenzymes	Lecture with power point discussion	
	6	Industrial and medical application of enzymes	1	Study the application of enzymes	Lecture and discussion	
IV	**Lipids, Oils and Fats**					
	1	Lipids - classification - properties - biological functions	1	Classify lipids and its properties	Lecture with power point discussion	Evaluation through Multiple choice questions, short test, quiz Formative assessment II
	2	Biological functions of phospholipids and glycolipids	2	Understand the functions of phospholipids and glycolipids	Lecture and power point discussion	
	3	Oils and fats - definition - characteristics and uses	1	Describe the characteristics and uses of oils and fats	Lecture and discussion	
	4	Common fatty acids in oils and fats - extraction and refining of oils	2	Understand the process of extraction and refining of oils	Lecture with power point discussion	
	5	Estimation of fats and oils - acid value, saponification value and Iodine value	3	Determine the saponification and iodine value of fats and oils	Lecture and discussion	
	6	Distinction between animal and vegetable fats. Hydrogenation and Rancidity	3	Differentiate animal and vegetable fats	Lecture with power point presentation	
V	**Vitamins and Hormones**					
	1	Vitamins -introduction - classification - Sources - biological function	3	Understand the classification and biological functions of vitamins	Lecture with power point presentation	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Deficiency diseases of Vitamin A, B, C, D, E and K	2	Recognize the diseases caused by vitamin deficiency	Lecture with power point presentation	
	3	Hormones introduction and classification	2	Classify hormones	Lecture with power point presentation	

	4	Structure and functions of thyroxin, adrenaline, bile acids, progesterone, testosterone and oestrone	3	Explain the structure and functions of hormones	Lecture	
	5	Effect of hormone activity on biological functions.	2	Understand the effect of hormone on biological functions	Lecture	

Course Instructor: Dr. M. Anitha Malbi HOD: Dr. G. Leema Rose

Semester - II

Part IV: NME

Applied Chemistry - II

Course Code: CNM202

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
2	**2**	**30**	**100**

Objectives:

1. To acquire knowledge on petroleum and petroleum products
2. To know about the preparation of cosmetics and perfumes
3. To understand the manufacture of matches and characteristics of paints and pigments

Course Outcome

COs	*Upon completion of this course, the students will be able to*:	PSO Addressed	Cognitive Level
CO-1	remember the refining of petroleum and manufacture of petroleum products	PSO-4	R
CO-2	analyse the therapeutic uses of pharmaceuticals	PSO-7	Y
CO-3	understand the process of manufacture of cosmetics and perfumes	PSO-8	U
CO-4	analyse the characteristics of matches, explosives, paints and pigments	PSO-2	Y

Total contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topics	Hours	Learning outcome	Pedagogy	Assessment / Evaluation
I	**Petroleum**					
	1	Petroleum - refining of petroleum - fractional distillation - cracking - thermal and catalytic cracking - advantages of catalytic cracking - octane rating - anti knock agents - cetane rating	3	Know the process of refining of petroleum and the importance of cracking	Lecture with power point presentation	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Petrochemicals - direct and indirect petrochemicals - methods involved in manufacture of petrochemicals - alkylation - pyrolysis	3	Understand the methods involved in the manufacture of petrochemicals	Lecture and discussion	

II	**Pharmaceuticals**					
	1	Preparation and therapeutic uses of the following: Antiseptics - alum - zinc oxide - boric acid. Mouth wash - hydrogen peroxide. Antacid - aluminium hydroxide. Analgesics - aspirin - paracetamol. Haematinics - ferrous fumerate - ferrous gluconate. Laxatives - epsom salt - milk of magnesia	6	Acquire knowledge about the therapeutic uses of pharmaceuticals	Lecture	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
III	**Cosmetics and Perfumes**					
	1	Preparation and uses - shampoo - hair dye - face cream - sun screen lotion - nail polish - nail polish removers - lipsticks	3	Acquire knowledge about cosmetics	Lecture with power point presentation	Evaluation through Multiple choice questions, short test, quiz Formative assessment II
	2	Perfumes - ingredients - isolation of essential oils - preparation of odorous substances - vanillin - diphenyl oxide	3	Remember the preparation of perfumes	Lecture and discussion	
IV	**Matches and Explosives**					
	1	Safety matches - classification - composition - manufacture of safety matches. Pyrotechny - composition of fireworks	3	Understand the process of manufacture and uses of safety matches and fire works	Lecture with power point presentation	Evaluation through Multiple choice questions, short test, quiz Formative assessment II
	2	Explosives - characteristics - classification - low explosives - gun powder - smokeless powder - primary explosives - preparation and uses of lead azide - mercury fulminate - high explosives - picric acid -dynamite	3	Gain knowledge about the classification of explosives	Lecture and discussion	

V	**Paints and Pigments**					
	1	Paints - general characteristics - constituents - pigment - vehicle - thinners - driers - plasticizers - fillers - anti-skinning agents - mechanism of film formation - paint removers - constituents.	3	Gain knowledge about the characteristics and constituents of paints.	Lecture with power point presentation	Evaluation through Multiple choice questions, short test, quiz Formative assessment I
	2	Pigments - manufacture of white lead - lithopone - titanium dioxide - ultra marine blue - red lead - chrome yellow- Prussian blue.	3	Know the methods of manufacturing pigments.	Peer group teaching	

Course Instructor: Dr. S. Ajith Sinthuja HOD: Dr. G. Leema Rose

Department of Chemistry

Semester – II
Physical Chemistry – I
Sub. Code: CC1721
Teaching Plan

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I.	**Gaseous State**					
	1.	Kinetic molecular theory of gases, Derivation	2	To understand the importance of kinetic theory of gases	Lecture, Discussion	Evaluation through short test,
	2.	Types of molecular velocities	3	To define and differentiate various types of molecular velocities	Lecture, Discussion	Formative assessment
	3.	Heat capacities of ideal gases	2	To gain knowledge about molar heat capacities	Lecture	Formative assessment
	4.	Principle of equipartition of energy	3	To get idea about the distribution of energy	Lecture	Formative assessment, Short test
	5.	Real gases , Vanderwaal's equation of state	2	To differentiate real and ideal gases	Question answer session Lecture	Formative assessment, Assignment
II.	**Liquid State**					
	1.	Structure and properties of liquids	2	To know the structure and properties of various liquids	Lecture with PPT Illustration	Formative assessment
	2.	Surface tension, effects	2	To know the effects of surface tension	Lecture, Illustration	Formative assessment
	3.	Co efficient of viscosity, effect of temperature and pressure.	2	To understand the effect of various factors on viscosity	Lecture, Discussion	Formative assessment, Short test
	4.	Additive and constitutive properties	4	To correlate molar volume and viscosity with chemical constitution	Lecture, Discussion	Formative assessment, Online Quiz
III	**Solid State**					
	1.	Symmetry in crystal systems	2	To know about different types of crystals	Lecture, Illustration	Formative assessment, Assignment

	2.	Space lattice and unit cell, Bragg's equation	3	To derive Bragg's equation	Lecture, Illustration	Formative assessment
	3.	X-ray diffraction, analysis of crystal structures	4	To analyse the diffraction patterns of crystals	Lecture	Formative assessment Short test
	4.	Types of crystals	3	To recognise the various types of crystals	Lecture with PPT Illustration	Seminar, Formative assessment
IV	**Ionic Equilibria**					
	1.	Electrolytes, Types	2	To know about different electrolytes	Lecture	Formative assessment
	2.	Ionic product of water, common ion effect.	1	To understand and differentiate ionic product and common ion effect.	Lecture, Discussion	Formative assessment, Short test
	3.	pH scale – buffer solutions ,Henderson equation	2	To acquire knowledge about various pH ranges and buffer.	Lecture	Short test
	4.	Hydrolysis of various salts	3	To evaluate the hydrolysis constants.	Lecture, Discussion	Formative assessment
	5.	Acid base indicators-Types	2	To know different acid base indicators	Lecture	Formative assessment
V	**Colloids**					
	1.	Classification and types of colloids	4	To classify different colloids	Lecture, Discussion	Formative assessment
	2.	Preparation and properties of colloids	3	To gather knowledge regarding the preparation of colloids	Lecture	Formative assessment
	3.	Surfactants-actions and applications	1	To understand the action of surfactants and applications	Lecture, Illustration	Formative assessment, Short test
	4	Emulsions, emulsifiers	4	To classify emulsions and assess the action of emulsifiers	Lecture, Discussion	Formative assessment, Seminar

Course Instructor: Sr. K. Francy HOD: G. Leema Rose

Semester II & IV
Allied Chemistry – Inorganic & Physical Chemistry
Sub. Code: CA1721
Teaching Plan

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Hydrogen and water**					
	1	Types of hydrogen – nascent hydrogen, active hydrogen, atomic hydrogen, ortho and para hydrogen Hydrogen as a future fuel	3	Know the types and importance of Hydrogen	Lecture	Group discussion
	2	Dueterium and tritium – preparation, properties and uses.	2	Explain the physical and chemical properties of deuterium and tritium	Lecture, quiz	Group discussion
	3	Water: Hardness types, determination of degree of hardness by EDTA method	3	Determine the hardness of water	Lecture with ppt	Formative assessment - I
	4	Heavy water: Preparation, properties and usesDO, BOD and COD (definition only).	4	Detect water pollution	Lecture with ppt	Formative assessment - I
II	**Metallurgy**					
	1.	Minerals and ores – difference between them	2	Differentiate between minerals and ores	Lecture	Multiple choice questions
	2.	Methods of dressing – roasting, calcinations, reduction by aluminothermic process, smelting, purification by electrolysis, zone refining, Kroll's process and Van Arkel de-Boer method.	4	Explain the methods of processing of ores	Lecture with ppt	Multiple choice questions

	3.	Extraction, properties and uses of titanium, molybdenum and tungsten	3	Know the process of extraction of Ti and W	Lecture	Group discussion
	4.	Preparation and uses - TiO_2 and $TiCl_4$, preparation and properties of MoO_2.	3	Explain the preparation and uses of TiO_2 and $TiCl_4$	llustration Lecture	Group discussion
III	**Thermodynamics**					
	1.	Exothermic and endothermic reactions with examples, change of enthalpy in a chemical reaction – sign of ΔH	3	Differentiate exothermic and endothermic reactions	Lecture with ppt	Formative assessment - II
	2.	Hess's law of constant heat summation, first law of thermodynamics – definition and mathematical statement	4	Define the laws of thermodynamics	Illustration	Formative assessment - II
	3.	Reversible and irreversible processes – difference between them. Isothermal and adiabatic processes – expression for q, w, ΔE &ΔH for reversible and irreversible isothermal expansion of an ideal gas.	4	Derive the expression for q, w, ΔE & ΔH for reversible and irreversible isothermal expansion of an ideal gas.	Lecture	Illustration, Seminar
IV	**Electrochemistry**					
	1.	Strong and weak electrolytes with examples – degree of ionization	2	Explain strong and weak electrolytes	Lecture with ppt	Quiz
	2.	Factors affecting degree of ionization – ionization constant – ionic product of	3	Understand the factors affecting ionisation	Lecture	Quiz

		water pH scale common ion effect and its applications				
	3.	Salt hydrolysis – types of salts with examples, derivation of hydrolysis constant and degree of hydrolysis of a salt formed from weak acid and strong base	3	Explain the types of salts	Lecture	Short test
	4.	Buffer solutions with examples. Solubility, solubility product and its applications.	3	Define buffer solutions, solubility and solubility product	Lecture with ppt	Short test
V	**Nuclear Chemistry**					
	1.	Radioactivity properties of α, β and γ rays	2	Explain the properties of α, β and γ rays	Lecture	Assignment
	2.	Soddy's group displacement law – radioactive decay, derivation of decay constant, half life period- derivation from decay constant	4	Derive expression for radioactive decay constant	Lecture with ppt	Assignment
	3.	Average life, radioactive series. Nuclear reactions - nuclear fission and fusion – Stellar energy.	3	Distinguish between different types of nuclear reactions	Lecture	Formative assessment - III
	4.	Applications of radioactivity – in medicine, agriculture, industry and radio carbon dating.	2	Know the applications of radioactivity	Group discussion	Formative assessment - III

Course Instructor: R. Gladis Latha HOD: G. Leema Rose

NMEC
Semester II
Fuel Chemistry
Sub. Code: CNM172
Teaching Plan

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Energy sources**					
	1.	Renewable energy sources-Types of energy, definition and examples	2	To know the different types of renewable energy sources	Lecture, Discussion	Evaluation through short test, Online Quiz, Assignment,
	2.	Non-renewable energy sources, Types and examples.	2	To identify the different types of non renewable energy sources	Lecture, Discussion	Formative assessment
	3.	Types of fuels, determination of calorific value	2	To determine the calorific value of a fuel.	Lecture	Formative assessment
	4.	Classification of fuels, criterion for the selection of a fuel, properties of fuels	3	Analyse various factors to select a good fuel	Lecture Question answer session	Formative assessment, Short test
II	**Solid fuels**					
	1.	Natural, artificial and industrial solid fuels.	2	Identify the sources, and types of solid fuels.	Lecture with PPT Illustration	Formative assessment
	2.	Formation of coal, properties and classification	3	To classify different types of coal.	Lecture, Illustration	Formative assessment
	3.	Role of Sulphur and ash in coal, Advantages and disadvantages of solid fuels	2	To impart knowledge on the impurities in coal	Lecture, Discussion	Formative assessment, Short test
	4.	Preparation, composition and uses of coal gas, Fractionation of coal tar, liquefaction of coal.	2	To know the composition and uses of coal gas and fractionation of coal tar	Lecture, Discussion	Formative assessment, Online Quiz

III	**Liquid fuel**					
	1.	Petroleum and petrochemicals, Refining of petroleum	2	To attain knowledge on petrochemicals and refining of petroleum.	Lecture	Formative assessment, Assignment
	2.	Composition and uses of main petroleum fractions, Cracking-types, advantages.	3	To clarify various petroleum fractions and the formation of different compounds.	Lecture, Discussion	Formative assessment
	3.	Octane rating, cetane rating, Petrochemicals	2	To get a clear idea about octane and cetane number	Lecture	Formative assessment Short test
	4.	Catalysts used in petroleum industry, methods involved in the manufacture of petrochemicals.	3	To have an exposure about the catalysts and methods used in petroleum industry.	Lecture, Discussion	Seminar, Formative assessment
IV	**Gaseous fuel**					
	1.	Gaseous fuel – Classification, examples and their importance.	3	To classify gaseous fuels	Lecture	Formative assessment
	2.	Natural gasoline – aviation gasoline – artificial gaseous fuels	2	To learn about the types of gasoline	Lecture, Discussion	Formative assessment, Short test
	3.	Water gas and producer gas - manufacture, composition and uses	2	To focus on the manufacture and nature of water and producer gases.	Lecture, Discussion	Short test
	4.	Semi water gas and LPG – composition and uses. Bio gas generation	2	To learn the generation of bio gas.	Lecture with PPT Illustration	Formative assessment
V	**Rocket and Nuclear fuels**					
	1.	Solid and liquid propellants , Homogeneous and heterogeneous	2	To classify the different fuels.	Lecture, Discussion	Formative assessment

		propellants				
	2.	Propellants used in rocket and guided missiles.	2	To identify the propellants used in rockets.	Lecture	Formative assessment
	3.	Nuclear propellants, fertile materials, Nuclear fuel cycle in India	2	To impart knowledge on nuclear processes.	Lecture with PPT Illustration	Formative assessment, Short test
	4.	Heavy water reactor and fast breeder reactors	3	To focus on various reactors.	Lecture with PPT Illustration	Formative assessment, Seminar

Course Instructor: Sr.Francy HOD: G. Leema Rose

Semester IV
Organic Chemistry – II
Sub. Code : CC1741
Teaching Plan

Unit	Module	Description	Hours	Learning outcome	Pedagogy	Assessment / evaluation
I	**Carbonyl Compounds**					
	1	Structure, reactivity and general methods of preparation of aldehydes and ketones	2	Interpret the structure of aldehydes and ketones	Lecture method	Short test, MCQ, Assignment
	2	Nucleophilic addition and condensation reactions	1	Differentiate addition and condensation reactions	Lecture method	Evaluation through short test, Online Quiz, Assignment,
	3	Mechanisms of Aldol condensation	1	Apply the mechanism to other condensation	Seminar	Formative assessment
	4	Benzoin condensation, Knoevenagel condensation	2	Evaluate the condensation reactions	Seminar	Formative assessment
	5	Perkin & Cannizzaro reaction and Benzil-Benzilic acid rearrangement.	2	Recognise rearrangements	Lecture method	Formative assessment, Short test
	6	Baeyer-Villiger - oxidation	1	Describe oxidation	Power point	Formative assessment, Short test
	7	Reductions Clemmensen, Wolff-	2	Relate the reduction process of various	Lecture method	Formative assessment,
		Kishner, $LiAlH_4$ and $NaBH_4$ reductions.		reducing agents		Short test
II	**Carboxylic Acids and their Derivatives**					
	1	Preparation and reactions of monocarboxylic acids	2	Learn the various methods of preparation	Lecture method	Short test, MCQ, Assignment
	2	Typical reactions of dicarboxylic acids, hydroxy acids	2	Understand the different reactions of acids	Semina	Evaluation through short test, Online Quiz, Assignment,

	3	Typical reactions of unsaturated acids - succinic, phthalic, malic, tartaric, maleic and fumaric acids.	3	Compare the reactions of various unsaturated acids	Power point	Formative assessment
	4	Preparation and reactions of acid chlorides, anhydrides, esters and amides	2	Know the various methods of preparation	Lecture method	Formative assessment
	5	Mechanism of Claisen condensation and Hofmann rearrangement	2	Apply the mechanism in rearrangements	Lecture method	Formative assessment, Short test
III	**Functional Groups Containing Nitrogen**					
	1	Preparation and important reactions of nitro compounds, nitriles and iso nitriles	2	Interpret the structure and reactions of nitro compounds	Lecture method	Short test, MCQ, Assignment
	2	Preparation of amines Gabriel phthalimide synthesis, properties	1	Learn the various methods of preparation	Lecture method	Evaluation through short test, Online Quiz, Assignment,
	3	Carbylamine reaction, Hoffmann's exhaustive methylation	2	Interpret the mechanisms	Lecture discussion	Formative assessment
	4	Hofmann elimination reaction; distinction among 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.	3	Differentiate 1°, 2° and 3° amines	Lecture method	Formative assessment
	5	Preparation of diazonium Salts and synthetic applications	2	Learn the various methods of preparation	Lecture method	Formative assessment, Short test
	6	Curtius rearrangement	1	Apply the mechanism in	Power point	Formative assessment,
				rearrangement		Short test
IV	**Active methylene compounds**					
	1	Reactivity of active methylene group.	1	Know the importance of active methylene group	Lecture method	Short test, MCQ, Assignment
	2	Preparation and properties of acetoacetic ester	1	Understand the various methods of preparation	Lecture method	Evaluation through short test, Online Quiz, Assignment,
	3	Acid hydrolysis and	1	Differentiate acid and	Seminar	Formative

		ketonic hydrolysis		ketonic hydrolysis		assessment
	4	Synthetic applications of acetoacetic ester - synthesis of mono alkyl acetone	1	Recognize the advantage of acetoacetic ester	Power point	Formative assessment
	5	Synthesis of butanoic acid, 2 - pentanone, acetonyl acetone,	1	Learn the various synthesis	Lecture method	Formative assessment, Short test
	6	Synthesis of succinic acid, α,β unsaturated acid, 2,5 – diketone, 1,3 – diol, γ - keto acid and 4 - methyl uracil Preparation of Malonic ester and its synthetic applications	2	Know the importance of synthesis	Lecture method	Formative assessment, Short test
	7	Synthesis of pentanoic acid, succinic acid, pentanedioic acid, adipic acid synthesis of β - keto acid, α,β - unsaturated acid, cyclo alkane carboxylic acid and barbituric acid	2	Explain the various synthesis	Lecture method	Formative assessment, Short test
	8	Preparation, and synthetic applications of cyano acetic ester	1	Know the importance of cyano acetic ester	seminar	Formative assessment, Short test
	9	Synthesis of malonic acid, propionic acid, α,β unsaturated acid, succinic acid and β-amino ester, cycloalkanes. Relative stability - Baeyer's strain theory and modification.	2	Learn the various synthesis	Lecture method	Formative assessment, Short test
V	**Aromatic hydrocarbons**					
	1	Concept of Aromaticity and characteristics of aromatic compounds, Huckel's rule.	2	Know the difference between aromatic and non aromatic compounds	Lecture method	Formative assessment, Short test
	2	Aromatic character of cyclic hydrocarbons	1	Understand the aromatic character	Seminar	Formative assessment, Short test
	3	Benzene isolation, preparation and structure	2	Learn the preparation and structure	Lecture method	Formative assessment, Short test

	4	Electrophilic aromatic substitution, halogenation, nitration	2	Differentiate substitution reactions	Seminar	Formative assessment, Short test
	5	Mechanisms of sulphonation, Friedel-Craft's alkylation and acylation.	2	Interpret mechanisms	Power point	Formative assessment, Short test
	6	Ortho, para and meta Directing effects of the groups	2	Predict the Ortho, para and meta Directing effects of the groups	Lecture method	Formative assessment, Short test

Course Instructor: Dr.M.Anitha Malbi HOD: G. Leema Rose

Semester – IV
Paper VI- Elective II –Industrial Chemistry – II
Sub. Code: CC1743
Teaching Plan

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Petroleum Industry**					
	1	Petroleum and petrochemicals, refining of petroleum, composition and uses of main petroleum fractions	1	Understand the refining process of petroleum its composition and uses	Lecture with PPT	Short test
	2	Cracking, thermal and catalytic cracking, advantages of catalytic cracking and Octane number.	2	Gain knowledge on Cracking process	Lecture	Multiple choice questions
	3	Cetane number, ignition and flash points, anti knock agents, unleaded	2	Know the different characteristic of	Lecture and Question answer	Assignment Formative assessment -I
		petrol, anti diesel knock agents and hydrocarbons from petroleum.		petroleum	session	
	4	Petrochemicals, direct and indirect petrochemicals, Methods involved in manufacture of petrochemicals, alkylation, pyrolysis, halogenation, hydration and polymerization.	2	Learn the catalysts used in petroleum industry and the manufacture process of petrochemicals	Lecture, Seminar	Short test

	5	Classification of petrochemicals, examples. Manufacture of synthetic petrol by Bergius process and Fischer – Tropsh process.	2	Classify the petrochemicals	Lecture with PPT and Question answer session	Assignment Formative assessment
	6	Manufacture and uses of petrochemicals, Methanol, Ethanol, Isopropyl alcohol, formaldehyde, Ethylene glycol, Glycerol, Phenol and Acetone .	2	Know the manufacture and uses of petrochemicals	Lecture	Quiz
	7	Catalysts used in petroleum industry. Petrochemical Industries in India.	1	Know the Catalysts used and Petrochemical Industries in India	Group discussion	Assignment, Formative assessment
II	**Fertilizers and agro chemicals**					
	1	Plant nutrients, Macronutrients, Micronutrients. Need for fertilizers, characteristics of a good fertilizer. Role of N, P and K in plant growth , Classification of fertilizers, Natural fertilizers and artificial fertilizers.	2	Understand the need for fertilizers and characteristics of a good fertilizer.	Lecture, Seminar	Short test
	2	Classification, manufacture and uses of artificial fertilizers such as Urea, Calcium cyanamide, Calcium	2	Know the classification and manufacture of artificial	Lecture with PPT and Question answer session	Assignment, Formative assessment
		ammonium nitrate Superphosphate of lime-Triple superphosphate, Potassium chloride and DAP.		fertilizers		
	3	NPK fertilizers, Biofertilizers and its advantages. Agro chemicals and its Classification. Preparation and Uses of Lead arsenate	3	Understand the advantages of Biofertilizers	Group discussion	Quiz

	4	Preparation and Uses of Calcium arsenate, DDT, Methoxychlor, BHC, Chlordane, Parathion, Malathion and Baygon	2	Know the Preparation and Uses of Insecticides	Group discussion	Short test
	5	Preparation and Uses of Fungicides like Lime, Sulphur, Bordeaux mixture, Sodium sulphate and Thallium Sulphate.	1	Know the Preparation and Uses of Fungicides	Lecture with PPT	Assignment ,Formative assessment
	6	Preparation and uses of Weedicides like Butachor, Eptam (EPTC) and DNOC.	1	Learn the Preparation and Uses of weedicides	Lecture with PPT	Quiz
	7	Preparation and uses of Rodenticides like Zinc phosphide, Aluminium phosphide, Coumachlor and Warfarin	1	Know the Preparation and Uses of Rodenticides	Group discussion	Multiple choice questions
III	**Rubber**					
	1	Importance of rubber Latex , Coagulation of rubber, Refining of Crude rubber and Drawbacks of raw rubber	3	Understand the Importance and Refining of rubber	Lecture with PPT	Short test
	2	Rubber fabrication Vulcanisation, Techniques of vulcanisation and Properties of vulcanised rubber	2	Learn the fabrication and Vulcanisation Techniques	Lecture with PPT	Assignment, Formative assessment
	3	Physical and chemical properties of rubber, Solvents for natural rubber and its	2	Learn the properties of rubber	Group discussion	Quiz
		Classification				
	4	Synthetic rubber and its classification. Manufacture, Properties and uses of Buna-S	1	Know the Manufacture and Properties of rubber	Lecture with PPT and Question answer session	Multiple choice questions
	5	Properties and uses of Neoprene, Buna-S,Thiokol, Silicon rubber, Polyurethane and Spandex	1	Understand the Properties and uses of Neoprene, Buna-S and Thiokol	Group discussion	Quiz

	6	Properties and uses of Reclaimed, Spong, foam, laminates, rubber cement and thermocole .Applications of rubber.	1	Know the applications of rubber.	Lecture with PPT and Question answer session	Assignment
IV	**Matches and explosives**					
	1	Safety matches, classification and its composition. Manufacture of Safety matches. Pyrotechnology and composition of fireworks.	2	Learn the classification, composition and Manufacture of Safety matches.	Lecture with PPT and Question answer session	Short test
	2	Explosives and its Characteristics. Characteristics of Low explosives, Gun powder and Smokeless powder. Preparation and uses of Primary explosive like Lead azide	3	Know the Characteristics of explosives and its preparation.	Lecture with PPT	Assignment
	3	Preparation and uses of Primary explosives like Mercury fulminate, Diazodinitrophenol, Tetryl, Ethylene dinitramine. High explosives, Trinitrotoluene, Picric acid and Ammonium picrate	2	Know the Preparation and uses of Primary explosives	Lecture with PPT	Quiz
	4	Glyceryl trinitrate, Dynamite, PETN, Cyclonite and HMX. Toxic chemicals	1	Understand the effect of Toxic chemicals	Group discussion	Multiple choice questions
	5	Preparation and properties of Mustard,	2	Understand the Preparation and	Lecture with PPT and	Quiz
		Phosgene, Nerve gases, Adamsite, Chloroacetophenone and Chloropicrin.		properties of Toxic chemicals	Question answer session	
	6	Screening of smokes, Incendiaries and Explosives in India.	2	Know the Explosives in India.	Lecture with PPT	Short test
V	**Protective coatings and silicates**					

	1	Definitio Classification and Composition of Paints Manufacture and Process of setting of paint, Requirements of a good paint and Importance of pigment volume concentration-.	2	Learn the Classification and Composition of paints	Lecture with PPT and Question answer session	Short test
	2	Applications. Emulsion paints, Constituents, advantages , methods of manufacture, chemical action and paint removers.	3	Learn the Applications and chemical action of paints	Group discussion	Assignment
	3	Definition Classification and manufacture of Varnishes. Raw materials and composition of Varnishes. Definition, Composition and importance lacquers	2	Know the Classification and manufacture of Varnishes and Lacquers	Lecture with PPT and Question answer session	Quiz
	4	Definition of Cement, Raw materials used in the Manufacture of cement and Setting of cement.	1	Understand the Manufacture process of cement	Lecture with PPT	Multiple choice questions
	5	Properties Quality test and uses of cement. Manufacture, Physical and Chemical properties of Glass. Preparation and uses of Special glasses like fused silica glass, Vycor glass, optical glass, lead glass, coloured glass, opal glass, safety glass, fibre glass laminates, glass wool and flint glass.	2	Understand the Physical and Chemical properties of glasses	Lecture with PPT	Quiz
	6	Pyrex and jena glasses, Definition and classification of Refractories. Definition, uses, classification of Abrasives. Natural abrasives and Synthetic abrasives.	2	Know the uses and classification of Refractories and abrasives.	Lecture with PPT	Short test

Course Instructor: L. Deva Vijila HOD: G. Leema Rose

Department of Chemistry
Teaching Plan
Even Semester 2019

Course Outcome

Semester **: VI** **Major Core VIII**
Name of the Course **: Organic Chemistry IV**
Course code **: CC1761**

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	recognize optical activity and the types of isomerism	PSO - 1	R
CO - 2	interpret the principles of spectroscopy and photochemistry	PSO - 3	Ap
CO - 3	apply spectral rules to calculate λ_{max} values	PSO - 6	Ap
CO - 4	evaluate different spectra	PSO - 5	E
CO - 5	apply ir spectra in functional group analysis	PSO - 6	C
CO - 6	know the medicinal importance and elucidate the structure of alkaloids	PSO - 8	C
CO - 7	classify, differentiate and synthesise various dyes	PSO - 2	An

Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Section	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Stereochemistry**					
	1.	Optical activity and Chirality	2	To understand the importance of optical isomerism	Lecture, Discussion	Evaluation through short test
	2.	R-S notation, enantiomers and diastereomers	3	To differentiate enantiomers and diastereomers	Lecture, Discussion	Formative assessment
	3.	Optical activity of compounds without asymmetric carbon atoms	2	To gain knowledge about optical activity	Lecture	Formative assessment
	4.	Methods of distinguishing geometrical isomers, determination of configuration of ketoximes	3	To get idea about geometrical isomerism	Lecture	Formative assessment, Short test
	5.	Conformational analysis of ethane, n-butane and cyclohexane energy diagrams.	2	To differentiate different energy diagrams	Question answer session, Lecture	Formative assessment, Assignment
II	**Spectroscopy-I**					
	1.	General principles, introduction to absorption and emission spectroscopy	2	To know about principles of spectroscopy	Lecture with PPT Illustration	Formative assessment
	2.	Types of electronic transitions- bathochromic and	2	To know the types of electronic transitions	Lecture, Illustration	Formative assessment

		hypsochromic shifts				
	3.	Application of Woodward Rules for calculation of λ_{max} for different molecules	2	To understand clearly about the calculation of λ_{max}	Lecture, Discussion	Formative assessment, Short test
	4.	Photochemical reactions of ketones, Norrish type I and type II reactions	4	To study about photochemical reactions	Lecture, Discussion	Formative assessment, Online Quiz
III	**Spectroscopy-II**					
	1.	Molecular vibrations and origin of IR spectra - IR absorption positions of O, N and S containing functional groups	2	To know about molecular vibrations	Lecture, Illustration	Formative assessment, Assignment
	2.	Hydrogen bonding, conjugation,. IR absorptions-fingerprint region	3	To learn about fingerprint region	Lecture, Illustration	Formative assessment
	3.	Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it	4	To analyse the factors influencing chemical shift	Lecture	Formative assessment Short test
	4.	Interpretation of NMR spectra of simple compounds	3	To recognise the various spectra compounds	Lecture with PPT Illustration	Seminar, Formative assessment

IV	**Alkaloids and Terpenoids**					
	1.	Natural occurrence, structural features and isolation of alkaloids	2	To know about different alkaloids	Lecture	Formative assessment
	2.	Structural elucidation and synthesis of coniine, piperine and nicotine.	1	To understand and differentiate different alkaloids	Lecture, Discussion	Formative assessment, Short test
	3.	Significance of number of peaks and peak area. Spin-spin coupling and coupling constant.	2	To acquire knowledge about peaks and coupling constant	Lecture	Short test
	4.	Occurrence and classification of Terpenoids, isoprene rule	3	To evaluate and classify terpenoids	Lecture, Discussion	Formative assessment
	5..	Elucidation of structure and synthesis of citral, geraniol, menthol and α-terpeniol.	2	To know about the structure of various terpenoids	Lecture	Formative assessment
V	**Dyes**					
	1.	Classification based on application and chemical structure with examples.	4	To know about the classification of dyes	Lecture, Discussion	Formative assessment
	2.	Colour and constitution of dyes. Chemistry of dyeing	3	To gather knowledge regarding thecolour and constitution of dyes	Lecture	Formative assessment
	3.	Triphenyl methane dyes -	1	To understand the synthesis	Lecture, Illustration	Formative assessment,

		malachite green, rosaniline and crystal violet.		and application of dyes		Short test
	4	Phthalein dyes - Phenolphthalein and fluorescein. Anthraquinone dyes - Alizarin Indigo dyes- Indigo.	4	To learn the synthesis and applications of phthalein and anthraquinone dyes.	Lecture, Discussion	Formative assessment, Seminar

Course Instructor: G. Leema Rose

Course Outcome

Semester **: VI** **Major Core IX**
Name of the Course **: Inorganic Chemistry III**
Course code **: CC1762**

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	name the coordination compounds	PSO - 1	A
CO - 2	explain the theories of coordination compounds	PSO - 1	U
CO - 3	predict the colour, magnetic properties and geometry of coordination compounds	PSO - 2	C
CO - 4	analyse the nature of bonding in coordination compounds	PSO - 3	An
CO - 5	minimize the errors in chemical estimation	PSO - 5	An
CO - 6	employ the methods to separate the inner transition elements	PSO - 4	Ap
CO - 7	compare the properties of lanthanides and actinides	PSO - 2	An
CO - 8	explain the principles of gravimetric analysis	PSO - 1	U

Teaching Plan
Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Co-ordination chemistry I**					
	1	Double salts – co-ordination compounds – difference, definition and terminology – co-ordination complexes and complex ions – central ion and ligands – co-ordination number – co-ordination sphere – charge on a complex ion.	3	Know the difference between double salts and coordination compounds.	Lecture, Showing available coordination compounds and double salts.	Evaluation through short test
	2	Types of ligands - examples for each. Nomenclature of co-ordination compounds	2	Name the coordination compounds.	Group discussion	Evaluation through short test
	3	Isomerism in co-ordination compounds, structural isomerism – ionisation, hydrate, co-ordination, linkage and co-ordination position isomerism.	2	Know the types of isomerism exhibited by coordination compounds.	llustration Lecture	Assignment on isomerism
	4	Stereoisomerism – geometrical isomerism in tetrahedral and octahedral complexes - optical isomerism in octahedral complexes.	2	Know the types of isomerism exhibited by tetrahedral and octahedral compounds.	Lecture, Seminar	Evaluation through short test
II	**Co- ordination Chemistry – II**					
	1	Theories of co-ordination compounds- Werner's theory- postulates – verification of Werner's theory- cobalt ammine complexes.	4	Know the theories of coordination compounds	Question answer session	Multiple choice questions

	2	EAN rule – calculation of EAN with reference	3	Predict the stability of metal complexes.	Lecture	Short test Formative assessment – I
	3	Pauling's theory (VBT) – postulates - application of VBT to square planar and tetrahedral complexes, inner and outer complexes – merits and demerits of VBT. Shapes of d-orbitals.	4	Predict the structure of complexes using VBT.	Lecture with ppt Group discussion	Short test Formative assessment – I
	4	Crystal field theory – Crystal field splitting of tetrahedral, square planar and octahedral systems. Factors affecting the value of CFSE – crystal field splitting energy values and its application in the stability of complexes.	5	Apply CFSE and predict the stability of complexes.	Assignment on CFSE	Multiple choice questions
III	**Co-ordination chemistry – III**					
	1	Molecular Orbital Theory (MOT)– MO diagrams of ML_6 type complexes – weak and strong field ligands – spectrochemical series.	3	Differentiate strong and weak field ligands.	Illustration, Seminar	Short test
	2	Stability of metal complexes – relation between stability constant and dissociation constant – factors affecting the stability of metal complexes from thermodynamic data. Irving William series – stabilization of unstable oxidation state.	3	Predict the stability of complexes.	Lecture, Group discussion	Assignment
	3	Substitution reactions of square planar	5	Understand the	Lecture with ppt	Assignment

		complexes – trans effect .		substitution reactions of complexes.		
	4	Metal carbonyls - classification – examples – structure and nature of M-L bond in metal carbonyls – structures of mono, di and polynuclear carbonyls of Ni, Cr, Fe, Co and Mn. Application of complexes in qualitative and quantitative analysis.	3	Apply coordination compounds in qualitative and quantitative analysis.	Lecture, Illustration	Assignment
IV	**Transition Elements:**					
	1	. Group discussion with special reference to electronic configuration, oxidation state, spectral and magnetic properties, colour, variable valency-polyvalency of Vanadium-magnetic and catalytic properties, ability to form complexes.	2	Know the general characteristics of transition elements.		Multiple choice questions
	2	Difference between the first, second and third transition series. Extraction, properties and uses of Cu, Co and Ni. Preparation and uses of titanium(II) oxide, vanadium (V) oxide, potassium dichromate, potassium permanganate,potassium ferrocyanide, Potassium ferricyanide, Vaska's compound, platinum	3	Differentiate the transition series.	Lecture with ppt	Formative assessment – II

		(IV) chloride, chloroplatinic acid and purple of Cassius.				
	3	**Inner transition Elements:** Electronic configuration, oxidation states, colour, spectral and magnetic properties. Causes and consequences of lanthanide contraction	3	Know the general characteristics of inner transition elements.	Lecture	Quiz
	4	Extraction of lanthanides from monazite sand - separation of lanthanides by ion-exchange method - uses of lanthanides. Comparison between lanthanides and actinides.	4	Compare lanthanides and actinides	Lecture	Quiz
	5	Extraction, properties and uses of thorium and uranium - zinc uranyl acetate ,Uranium hexafluroide.	2	Know the extraction of Th and U	Lecture with ppt	Quiz
V	**Analytical Chemistry**					
	1	Types of errors- determinate and indeterminate errors- minimization of errors. Precision and accuracy- Comparison of precision and accuracy with example	3	Gain knowledge about errors.	Group discussion	Short test
	2	Standard deviation- mean deviation – relative mean deviation and coefficient of variance. Accuracy- absolute error- relative error- confidence limit- Rejection of a doubtful	2	Calculate standard deviation and mean deviation	Lecture.	Assignment

		value – Q Test and student T test .				
	3	Principles and requirements of gravimetric analysis, gravimetric steps- digestion, filtration, washing, drying and ignition.	2	Apply the principles of gravimetric analysis.	Demonstration	Formative assessment – III
	4	Mechanism of precipitation – factors affecting solubility of precipitate - co-precipitation- different types – prevention- post precipitation – prevention and difference between co-precipitation and post precipitation, precipitation from homogenous solution with examples.	4	Apply the principles of gravimetric analysis.	Lecture using ppt	Formative assessment – III

Course Instructor: R.Gladis Latha

Course Outcome

Semester : VI
Name of the Course : Physical Chemistry III
Course code : CC1763

CO - No.	Course Outcome Upon completion of course students will be able to	PSO -	CL
CO - 1	Recall phase rule.	PSO - 1	R
CO - 2	Understand phase diagrams	PSO - 1	C
CO - 3	Differentiate various photochemical processes	PSO - 4	U
CO - 4	Interpret Jablonski diagram	PSO - 4	Ap
CO - 5	Apply the electrochemical principles in batteries	PSO - 3	Ap
CO - 6	To deduce the expressions of rate constant	PSO - 5	An
CO - 7	Evaluate pH using electrodes.	PSO - 5	E
CO - 8	Elucidate the structure of molecules using spectral data	PSO - 8	C

Teaching Plan
Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Phase Equilibria**					
	1.	Concept of phase , components and degrees of freedom (definitions and examples) Derivation of Gibb's phase rule.	2	To derive Gibb's phase rule	Lecture, Discussion	Formative assessment, Short test, Assignment, MCQ
	2.	Phase diagram for one component system – water and sulphur system	2	Construct phase diagram for water and sulphur system	Lecture	
	3.	Two component system	1	To construct phase diagram for two component system	Lecture, Discussion	
	4.	Reduced phase rule and simple eutectic systems.	1	Construct phase diagram for simple eutectic system	Ppt presentation	
	5.	Lead-silver system – Pattinson's process of de-silverisation of lead,freezing mixtures-KI-H_2O system	2	Understand de-silverisation and potassium iodide-water system	Lecture	
	6.	Formation of compounds with congruent melting point	1	Understand congruent melting point	Ppt presentation	
	7.	Zinc-magnesium system and $FeCl_3$-H_2O system. Formation of compounds with incongruent melting points	2	Understand $FeCl_3$-H_2O system and incongruent melting points	Lecture	
	8.	Na_2SO_4-H_2O system and Solid-	1	Construct Na_2SO_4-H_2O	Lecture	

		gas equilibria		system		
	9.	$CuSO_4$-H_2O system.	1	Construct $CuSO_4$-H_2O system	Question answer session Lecture	
	10.	Efflorescence, deliquescence and hygroscopy	1	Understand Efflorescence, deliquescence and hygroscopy	Lecture, Discussion	
II	**Chemical Kinetics**					
	1.	Rate of reaction, expression of rate, factors influencing rate of reaction and theories of reaction rates	2	To know factors influencing rate of reaction and theories of reaction rates	Lecture with PPT Illustration	Formative assessment, Short test, Assignment, MCQ
	2.	Order and molecularity of a reaction	1	Understand order and molecularity of a reaction	Lecture, Illustration	
	3.	Definition and examples, differences between order and molecularity of a reaction	1	Differentiate order and molecularity of a reaction	Lecture, Discussion	
	4.	Various orders of reaction and their derivation zero, first and second order reaction	2	Derive zero, first and second order reaction.	Ppt presentation	
	5.	Definition, examples and derivation of rate constant and half life period.	1	Know rate constant and half life period of a reaction	Lecture	
	6.	Methods of determining order of reaction, use of Differential, Integral, Half-life method and Ostwald's isolation	2	Determine order of reaction	Ppt presentation	

		methods.				
	7	Concept of activation energy, effect of catalyst and calculation of energy of activation (Arrhenius equation)	1	Derive Arrhenius equation	Lecture	
	8	Collision theory of bimolecular gaseous reactions(activated complex theory)	1	Derive activated complex theory	Lecture	
	9	Comparison of collision theory and activated complex theory.	1	Differentiate collision theory and activated complex theory	Question answer session Lecture	
	10	Lindeman's theoryofunimolecularreactions and solving problems	2	Derive Lindeman's theoryofunimolecularreactions and able to slove problems in this topic	Lecture, Discussion	
III	**Electrochemistry – I**					
	1.	Definition of conductance, specific conductance, equivalent conductance and molar conductance	1	Know conductance, specific conductance, equivalent conductance and molar conductance	Lecture, Illustration	Formative assessment, Short test, Assignment, MCQ
	2.	Factors affecting conductance of a solution	1	Understand factors affecting conductance of a solution	Lecture, Illustration	
	3.	Transport number , determination of transport number by Hittorf's method and moving boundary method	1	Able to determine transport number	Lecture	
	4.	Strong and weak electrolytes ,variation of	2	Able to derive Debye-Huckeltheory of	Lecture with PPT Illustration	

		equivalent conductance with dilution and Debye-Huckeltheory of strong electrolytes		strong electrolytes		
	5.	Debye-HuckelOnsagarequation.Kohlrausch'slaw and its applications	2	Derive Debye-HuckelOnsagar equation and Kohlrausch'slaw	Question answer session Lecture	
	6.	Applications of conductance measurements	2	Understand the applications of conductance measurements	Lecture, Discussion	
	7.	Determination of λ infinity of weak acid and weak base and degree of dissociation of weak electrolytes	1	Determine degree of dissociation of weak electrolytes	Lecture, Illustration	
	8.	Solubility and solubility products of sparingly soluble salts and conductometric titrations and solvingproblems.	3	Understand solubility and solubility products of sparingly soluble salts and conductometrictitrations. Able to solve problems in this topic	Lecture	
IV	**Electrochemistry – II**					
	1.	Electrochemical cells ,chemical cells ,reversible and irreversible cells and determinationof EMF of cells	2	Understand Electrochemical cells –chemical cells – reversible and irreversible cells -EMF of cells	Lecture	Formative assessment, Short test, Assignment, MCQ
	2.	Cell representation,single electrode	1	Know various types of electrodes	Lecture, Discussion	

		potential,types of electrodes, metal-metal ion electrodes, amalgam electrodes and gas electrodes.				
	3.	Insoluble metal salt electrodes and oxidation – reduction electrodes.Standard hydrogen electrode (SHE) and calomel electrode	2	Understand standard hydrogen electrode (SHE) and calomel electrode	Lecture	
	4.	Derivation of Nernst equation	1	Derive Nernst equation for emf of cells	Lecture, Discussion	
	5.	Standard electrode potential, electro chemical series, thermodynamics of galvanic cells, ΔG,ΔH,ΔS and equilibrium constant (K).	2	To know electro chemical series and thermodynamics of galvanic cells ΔG,ΔHandΔS and equilibrium constant (K)	Lecture with PPT Illustration	
	6.	Concentration cells –with transference and without transference ,liquid junction potential and its elimination.	1	Understand Concentration cells with transference and without transference and liquid junction potential and its elimination	Question answer session Lecture	
	7.	Applications of EMF measurements ,determination of transport number, valency of an ion, pH of a solution using hydrogen, quinhydrone and glass electrode.	2	Able to grasp Applications of EMF measurements,determination of transport number, valency of an ion, pH of a solution using	Lecture, Discussion	

				hydrogen, quinhydrone and glass electrode.		
	8	Potentiometric titrations - acid-base, oxidation reduction and precipitation titrations.	1	Understand Potentiometric titrations	Lecture, Illustration	
	9	Decomposition potential and overvoltageand solving Problems	2	Know decomposition potential and overvoltage. Can able to solve problems from this topic	Lecture	
V	**Spectroscopy**					
	1.	Different regions of EMR spectrum, Born-Openheimer approximation ,types of molecular spectra – microwave (rotational) spectra theoretical principle, selection rule and applications in the determination of bond distance in diatomic molecules	4	To classify different regions of EMR and know about microwave spectroscopy.	Lecture, Discussion	Formative assessment, Short test, Assignment, MCQ
	2.	Vibrational (IR) spectra – theoretical principle, harmonic oscillator and unharmonicity – selection rule, intensity, modes of vibrations and types , force constant , applications of IR– hydrogen bonding	3	To gather knowledge regarding Vibrational spectra(IR)	Lecture	

		,Inter and Intramolecular hydrogen bonding				
	3.	Fermi resonance, overtones and combination bands.	1	To understand Fermi resonance, over tones and combination bands	Lecture, Illustration	
	4	Electronic spectra - selection rules, Frank types of transitions and pplications. Raman spectra - theoretical principle ,stokes and antistokes lines	2	To know Electronic and Raman spectra	Lecture, Discussion	
	5.	Comparison of IR & Raman Spectroscopy.	1	Differentiate between Raman spectra and IR Spectra.	Lecture, Discussion	
	6.	ESR spectra-theory and principle and hyperfine splitting ESR spectra of methyl radical .	2	To understand ESR Spectra	Lecture, Illustration	

Course Instructor: M. Anitha Malbi