COURSE OUTCOME

UNDERGRADUATE CHEMISTRY HONOURS (CBCS SYSTEM)

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
BSC	**2018**	**COURSE**	**COURSE NAME**	**COURSE OUTCOME**
		SEMESTER – 1 CC1 [Inorganic Chemistry-1] (FM 40)	UNIT 1: ATOMIC STRUCTURE	Student will get a good amount of knowledge about: Fine structure of atom, different quantum numbers, shapes of orbitals, wave function, wave equation, probability distribution of electron, filling of electrons in different orbitals of an atom.
			UNIT 2: PERIODICITY OF ELEMENTS	Student will acquire the knowledge in this Unit: Idea about different block elements (s, p, d & f), Different atomic features and properties e.g. atomic/ionic/ covalent radii, electronegativity, electron affinity, screening effect, effective nuclear charge and their calculations.
			UNIT 3: CHEMICAL BONDING	Student will get the knowledge about: Different types chemical bonds present in compounds, the suitable covalent structure, Molecular orbital diagrams, crystal packing, Lattice energy & its calculation, idea of polarization & its application,Polarity of chemical bond, dipole moment & its calculation, idea of hydrogen bonding and its application. Metallic bonding and band theory, semiconductor.
			UNIT 4: OXIDATION - REDUCTION	Student will acquire the knowledge about: Redox reactions, standard electrode potentials and its application

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 1 CC1 PRACTICAL (FM 20)	Experiments in Laboratory: * Titrimetric analysis * Acid-base titration * Redox titration	Students will acquire the knowledge about: ● different types of apparatus used for quantitative analysis, their calibration and use ● Strength of solutions and its preparation ● Idea of different indicators used ● Estimation of components in the mixture of acids or bases ● Idea of redox reaction, equivalent weight and its calculation ● Estimation of metal ions by redox titrimetric method
		SEMESTER – 1 CC2 [PHYSICAL CHEMISTRY] (FM 40)	Unit 1: Gaseous state	Students will learn Kinetic molecular model of a gas, Maxwell distribution and its use in evaluating molecular velocities and behavior of real gases.
			Unit 2: Liquid state	Students will acquire knowledge in the structure and properties of liquid.
			Unit 3: Solid state	Students will learn the laws of crsytallography, lattice structure of crsytalline solids. They become acquainted with the basic theory of X-ray crystallography.
			Unit 4: Ionic equilibria	Students will acquire concept of electrolyte, pH, buffer, solubility and solubility product. Also they will learn what is indicator and what is its range.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 1 CC2 PRACTICAL	Experiment based on surface tension, viscosity and ionic equilibrium are set	Students learn how to determine 1. Viscosity coefficient of an unknown solution. 2. Surface tension of an unknown solution. 3. pH of an unknown buffer. 4. Determination of dissociation constant of a weak acid.
		SEMESTER – 2 CC3 (FM 40)	Unit 1: Basics of Organic Chemistry	Students come to know fundamental features relating to organic chemistry. In this section,

				they understand basic matters that govern stability of molecules. In addition reaction intermediates, varieties of reagents and reaction mechanism are taught comprehensively.
			Unit 2: Stereochemistry	In this unit students learn orientation of molecules in three dimensional space. In this unit concept of chirality is explicitly taught.
			Unit 3: Chemistry of Aliphatic Hydrocarbons	Students learn style of functioning of basic skeleton of hydrocarbon family. They can differentiate paraffinic mode of alkane and reactive nature of alkene and alkyne. Here they also learn analogy between alkane and cyclo alkane.
			Unit 4: Aromatic hydrocarbon aromaticity	This unit describes special features of a class of compounds having intriguing characteristics feature of aromaticity. Students learn distinct reactions associated with this hydrocarbon family.
		SEMESTER – 2 CC3 PRACTICAL	Experiment based on Purification of Organic compounds, Mixed melting point, detection of boling points and Chromatographic identification of amino acids, sugars are set	Students learn 1. Detection of melting point and boiling points of Organic compounds. 2. Impact of impurity on pure compounds. 3. Purification of compounds by recrystallization. Analysis of compounds when present in trace amount..
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 2 CC4 [PHYSICAL CHEMISTRY - II] (FM 40)	Unit 1: Chemical Thermodynamics	Students will get the updated ideas of Thermodynamics
			Unit 2: Systems of Variable Composition	Students learn how thermodynamic parameters change with composition.
			Unit 3: Chemical Equilibrium	Students learn how to determine if a system is at equilibrium and if not which direction the reaction will shift to achieve equilibrium. Also they learn how to calculate the concentration of all species at equilibrium.

			Unit 4: Solutions and Colligative Properties	Students will be able to perform calculations and discuss the concepts of the 4 colligative properties: lowering of vapor pressure, elevation boiling point, depression freezing point, and osmotic pressure.
		SEMESTER – 2 CC4 PRACTICAL	Experiment based on surface tension, viscosity and thermodynamic properties are set	Students learn how to determine 1. Surface Tension of solutions of different compositions and composition of the unknown solution. 2. Coefficient of Viscosity of solutions of different compositions and composition of an unknown solution. 3. pH of a solution by Colour Matching. 4. heat capacity of the calorimeter 5. enthalpy of neutralization of hydrochloric acid with sodium hydroxide. 6. the enthalpy of ionization of ethanoic acid. 7. heat capacity of the calorimeter and integral enthalpy of solution of salts.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 CC5 [Inorganic Chemistry-II] (FM 40)	Unit 1: General principles of Metallurgy	Students will get the knowledge about: •Standard electrode potentials and its application, •reduction of metal oxides by carbon and carbon monoxide-Ellingham diagram, •purification of metal- different processes
			Unit 2: Acids and Bases	• acid-base theory, relative strength, types of acid-base reactions • solvent role in acid-base reactions • soft and hard acid-base concept
			Unit 3: Chemistry of s- and p-block Elements	• relative stability of different oxidation state •idea about hydrides, oxides and oxyacids of p-block elements • interhalogen compounds, polyhalides
			Unit 4: Noble Gases	• Inertness of noble gases • preparation, properties of noble gas compounds and their structure and bonding

			Unit 5: Inorganic Polymers	•Types of inorganic polymers and comparison with other type of polymers • some important inorganic polymers: their preparation, properties and structures
		SEMESTER – 3 CC5 PRACTICAL (FM 20)	(A) Titrimetric Estimation of single metal ion (B) Quantitative estimation of metal ions in mixtures (titrimetric method):	The students will learn about: • Estimation of single metal ion by iodometric titration process • Quantitative estimation of the component (metal ion) from a mixture by redox titrimetric processes
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 CC 6 (M 40)	Unit 1: Chemistry of Halogenated Hydrocarbons	Students learn different types of nucleophilic substitution reactions, impact of different parameters on these reactions. Chemistry of vinyl halides, allyl halides and aryl halides are intensely covered.
			Unit 2: Alcohols, Phenols, Ethers and Epoxides	Students acquire knowledge of different types of alcohols regarding preparation, properties and chemical reactivities etc. Transition of properties from alcohol to phenol is also taught along with some specific name reactions. Students also gain knowledge of ethers and epoxides.
			Unit 3: Carbonyl Compounds.	Students comprehensively cover the reactivity of carbonyl compounds. Students come across a plenty of name reactions and varieties of reagents sensitive to carbonyl compounds.
			Unit 4: Carboxylic Acids and their derivatives	Students learn characteristics of monocarboxylic acids, dicarboxylic acids, hydrtoxy acids and unsaturated acids like maleic acid and fumaric acid.
			Unit 5: Sulphur containing compounds	This unit basically put focus on sulphur analogue of alcohols, ethers and acids. Students can compare their understanding of Unit 2 and Unit 4.
		SEMESTER – 3 CC 6 PRACTICAL	Experiment related to identification of functional groups and several organic synthesis are covered.	Students identify presence of functional groups by authentic chemical tests.

				Along with conventional methods of synthesis students are exposed to green methods of synthesis. Students carry out different hands on experiments like Acetylation and Benzoylation of phenols and amines, Bromination and Nitration of acetanilide. Some classic synthesis like Aldol condensation, Benzilic acid rearrangements are also practiced
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 CC 7 [PHYSICAL CHEMISTRY] (FM 40)	Unit 1: Phase Equilibria:	Students enriched with the importance of Phase Diagrams Also they acquire knowledge about phase, component and degrees of freedom in different systems
			Unit 2: Chemical kinetics	Students learn how to determine rate law of chemical change based on experimental data. Also they acquire the concept of an activation energy in the context of the transition state
			Unit 3: Catalysis	Students gain the knowledge of catalyst characteristics, various catalytic reaction mechanisms.
			Unit 4: Surface chemistry	Students enriched with the idea of interfacial phenomenon like adsorption
		SEMESTER – 3 CC 7 PRACTICAL	Experiment based on phase rule, chemical equilibrium, chemical kinetics and adsorption are set	Students learn how to • determine CST and composition of phenol-water system • construct the phase diagram using cooling curves or ignition tube method • study the equilibrium of $I_2(aq) + I^- \rightarrow I_3^-(aq)$and $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n$ • study the kinetics of acid hydrolysis of methyl acetate with hydrochloric acid, Saponification of ethyl acetate • verify the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 SEC PAPER 1 (FM 40)	Unit 1: Drugs and Pharmaceuticals	Students learn a lot about medicinally important compounds. They acquire knowledge on antibiotics, antifungal agents, antimalarial compounds, antileprosy agents, antiviral compounds. In addition, antipyretic compounds, CNS agents are also covered. Importance of natural medicinal compounds like neem, haldi and vitamin C are brought in main course of study.
			Unit 2: Fermentation	Students come to know basics of aerobic and anaerobic fermentation. At the same time they learn synthesis of ethyl alcohol and citric acid. Importance of Vit B are also emphasized.
			Unit 3: Practicals	Students carry out hands on experiment to prepare aspirin, methyl salicylate, magnesium disicates.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 4 CC8 [Inorganic Chemistry-III] (FM 40)	Unit 1: Coordination Chemistry	The students will acquire the knowledge about: • IUPAC nomenclature, isomerism for coordination complexes •bonding nature in coordination complexes; • Crystal field splitting in different geometrical environments: stabilization energy, its calculation • Qualitative idea about ligand field theory and Molecular orbital theory.
			Unit 2: Transition Elements	• General group trends for different physical properties • Comparison between the different d-series
			Unit 3: Lantanoids and Actinoides	•Colour and spectral properties of series elements • magnetic properties of metal and it calculation
			Unit 4: Bioinorganic Chemistry	•Beneficiary metal in biology: their roles in biology

				• Toxic metals: their toxic action in bio-system, its prevention through chelation • Different metal containing enzymes and their roles • Oxygen transport and storage proteins: haemoglobin (Hb) and myglobin (Mb), • Metal storage and transfer protein
		SEMESTER - 4 CC8 PRACTICAL (FM 20)	a) Gravimeric Analysis b) Inorganic Prepations c) Chromatography of metal ions	The students will acquire the knowledge about: • Gravimetric process, its application • Preparation procedures of different inorganic compounds • Principle of chromatographic separation of metal ions from mixture
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 4 CC9 (FM 40)	Unit 1: Nitrogen Containing Functional groups	Students learn characteristics of amines and can also distinguish 1^0, 2^0 and 3^0 amines using Hinsberg reagents. Basicity of amines in gaseous phase and solvent are discussed. Apart from this many classic name reaction under this section are covered in details.
			Unit 2: Polynuclear hydrocarbons	In this unit students can correlate their earlier acquired knowledge on aromaticity with many polynuclear hydrocarbon like naphthalene, phenanthrene and anthracene.
			Unit 3: Heterocylic compounds	In this unit students learn many features of five and six membered heterocyclic compounds like their synthesis, reactions etc. Even in this section structure elucidation part is given special attention. This unit also make many classic name reaction in front.
			Unit 4: Alkaloids	Students acquire knowledge on alkaloids. This unit deals with isolation of many natural compounds like Hygrine, Nicotine etc. Structure elucidations of these compounds are also covered. Physiological action of alkaloid is also covered. Students know importance of Hoffmann's exhaustive methylation in alkaloid chemistry.
			Unit 5: Terpenes	Students learn isoprene rule. Structure elucidation of Citral and

				Neral and α-Terpenol are important component of this unit.
		SEMESTER - 4 CC9 PRACTICAL	Experiments based on Detection of Extra elements, functional group and qualitative analysis of organic compounds.	By hands on experiments students identify special elements present in a compound both by conventional and green methods. Nitrogeneous functional groups are also being detected. They come to know systematic approach of analysing organic compounds.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 4 CC10 [PHYSICAL CHEMISTRY -IV] (FM 40)	Unit 1: Conductance	To acquaint with • transport number of an ion, • ionic mobility, • conductometric titration
			Unit 2: Electrochemistry	Students learn how to • construct and calculate EMF of an electrochemical cell. • Determine different thermodynamic parameters like enthalpy, entropy etc. from EMF measurement.
			Unit 3: Electrical & Magnetic Properties of Atoms and Molecules	Students get updated with the concepts of dipole moments, molecular polarizability, Concept of Diamagnetism, Para-magnetism, Magneticsusceptibility and its measurement.
		SEMESTER - 4 CC10 PRACTICAL	Experiment based on conductometry and potentiometry are set.	Students learn how to • Determine cell constant • Determine equivalent conductance degree of dissociation and dissociationconstant of a weak acid • Perform conductometric titration • Perform potentiometric titration
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME

		SEMESTER – 4 SEC Paper 2 (FM 40)	GREEN METHODS IN CHEMISTRY:	This is an unique concept for student, they know about how to reduce pollution during chemical reactions and different chemical process such as dry cleaning, painting etc. they know about 12 principles of Green Chemistry and how it make the development sustainable. They know how to synthesise ibruphen, paracetamol etc drug molecule by minimizing pollution.
			Practical	Students carry out different green reaction.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 5 CC11 (FM 40)	Unit 1: Pericyclic reactions	Students learn completely different types of reactions which are initiated by either heating or by photochemical activation. FMO approach is given a special importance for understanding these reactions.
			Unit 2: Nucleic acids	Students learn basics of Adenine, Guanine, Cytosine, Uracil and Thymine. Ideas on Nucleosides and Nucleotides are also being covered
			Unit 3: Amino acids, peptides and Proteins	Students acquire knowledge on amino acids, peptides which includes their synthesis and several characteristic features. Determination C-end and N-end of peptides are highlighted
			Unit 4: Enzymes	Students learn importance of biocatalysts. Active site of big biomolecules are projected in this unit.
			Unit 5: Lipids	Fats and oils are main focus of this unit.
			Unit 6: Concept of Energy in Biosynthesis	Role of ATP, NAD+, FAD are known by students.
		SEMESTER - 5 CC11 PRACTICAL	Experiments based on biochemistry	Students learn estimation of glycine and protein. They conduct study on action of salivary amylase, saponification of fat. Iodine number of oils are also detected.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME

		SEMESTER – 5 CC12 [PHYSICAL CHEMISTRY -V] (FM 40)	Unit 1: Quantum chemistry	Students will be able to – explain how quantum mechanical systems differ from classical systems. – explain the origin of quantized energy levels. – understand the relationship between the energy levels and measurements made using spectroscopic methods.
			Unit 2: Molecular spectroscopy	Students will be able to apply quantum mechanical theory in the behavior of molecular systems in presence of an external electromagnetic field in different frequency ranges
			Unit 3: Photochemistry	Students will be able to explain theory and practice of common photochemical and photo-physical methods
			Unit 4: Colloids	Students will be able to understand – the colloidal system, Classification of colloidal systems – preparation and purification techniques of colloidal solution – kinetic and optical properties of colloids – electrical properties of colloids - electric double layer and zeta potential
			Unit 5: Statistical Thermodynamics	Students will be able to understand – the connection between statistics and thermodynamics. – different ensemble theories used to explain the behavior of the systems.
		SEMESTER – 5 CC12 PRACTICAL	Experiment based on spectroscopy and photochemistry are set.	Students learn how to – Verify Lambert – Beer's Law and determine the concentration of $KMnO_4$/ $K_2Cr_2O_7$ in asolution of unknown concentration. – λ_{max} values from the absorption spectra of $KMnO_4$/ $K_2Cr_2O_7$ (in 0.1 M H_2SO_4) Also they will be able to Analysis of the given Vibration – Rotation Spectrum of HCl $[g]$.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME

		SEMESTER – 5 DSE Paper 1 [Analytical Methods in Chemistry] (FM 40)	1. Qualitative and quantitative aspects of analysis	The students will acquire the knowledge about: ● Basic principles of quantitative chemical analysis: Different errors, precision, accuracy, normal laws of distribution of errors, statistical tests of data of analysis, Rejection of data and confidence level. ● Basic principles of Instrumentation, Fundamental laws of spectroscopy, origin of spectra, selection rules ● Theory of thermogravimetry (TG): application to estimate metal ions from their mixture ● Basic principles of pH-metric, potentiometric and conductometric titration, application to determine the value of pK_a ● Basic principles of solvent extraction: distribution ratio, distribution constant, extraction efficiency, application to determine the metal ions from mixture ● Basic principles of Chromatography: different types and its application
			2. Optical methods of analysis	
			3. Basic principle of quantitative analysis	
			4. Thermal methods of analysis	
			5. Electroanalytical methods	
			6. Separation Techniques: ● Solvent Extraction ● Chromatography ● Ion-exchange	
		SEMESTER – 5 DSE Paper 1 PRACTICAL (FM 20)	1. Separation Technique 2. Solvent extraction 3. Spectrophotometry	Student will get the knowledge about: ● Different separationtechniques; its application to determine the component metal ion from mixture. ● Determination of pK_a value of an indicator, bio-chemical oxygen demand (BOD) and Chemical oxygen demand (COD) through spectrophotometric method.
		SEMESTER – 5 DSE Paper 2 INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE (FM 40)	Unit 1: Silicate Industries; Glass, Ceramic, Cement	Students will learn about the followings • Composition, properties, classification and manufacturing procedure of glass, ceramics and cements. • Applications of different types of glass, ceramic and cements. Mechanism of setting of cement
			Unit 2: Fertilizers	Students will learn about the followings • Different types of Fertilizers with their manufacturing procedure.

				Comparison between Inorganic and Bio fertilizers.
			Unit 3: Surface Coatings	Students will learn about the followings • Objectives of surface coatings • Different types of paints, pigments, binders, thinners, fillers etc. Different ways of surface coatings with mechanism
			Unit 4: Batteries	Students will learn about the followings • Different types of Batteries with their structures and cell reactions. • Pb -acid battery, Li ion battery, Solar cell, Fuel cell etc
			Unit 5: Alloys and Catalysis	Students will learn about the followings • Classification of Alloys and different types of steel. • Mechanism of homogenous and heterogenous catalysis
		SEMESTER – 5 DSE Paper 2 PRACTICAL	INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE	Students will learn to determine the followings in LAB • Free acidity in ammonium sulphate fertilizer. • Calcium in calcium ammonium nitrate fertilizer. • Phosphoric acid in superphosphate fertilizer. • Composition of dolomite. • Analysis of cements.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 6 CC13 [Inorganic Chemistry-IV] (FM 40)	Unit 1: Theoretical principles in Qualitative analysis (H_2S scheme)	The students will get a good amount knowledge about: • Qualitative analysis of metal ions in different groups using specific group reagents: idea about solubility product and common ion effect; its application
			Unit 2:Organometallic Compounds	• Definition, types of organometallic compounds, hapticity of organic ligands •Metal carbonyls: its structure and bonding • some important organometallic compounds: Ferrocene, Zeise's salt: their preparation, properties, structure and bonding

			Unit 3: Reaction kinetics and Mechanism	• substitution reactions in square planar complex, • trans effect: theories and application • Kinetic *vs* thermodynamic stabilities
			Unit 4: Catalysis by Organometallic Compounds	• idea of different metal complex catalysts • Application of organometallic catalysts for synthesis e.g. polymerization, hydrogenation, hydroformylation etc
		SEMESTER - 6 CC13 PRACTICAL (FM 20)	1. Qualitative semimicro analysis of mixture 2. Preparation/systhesis of Fe, Cu complexes	The students will learn about: •Qualitative semimicro analysis •Identification of metal ions and anions from mixture through systematic analysis • Preparation of some important compounds by controlled method.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 6 CC14 (FM 40)	UNIT 1 Organic Spectroscopy	Students learn UV-VIS, IR, ^{1}H-NMR spectroscopy in detail.
			UNIT 2 Carbohydrates	Students acquire knowledge on molecules of carbohydrate family.
			UNIT 3 Dye	Students come to know chemistry behind many colouring compound used in Dye industry like Methyl orange, Congo red etc. They also understand structure elucidation part.
		SEMESTER - 6 CC14 PRACTICAL	Experiment based on Organic synthesis and qualitative analysis of compounds.	Students learn preparation of UF resin, methyl orange. Systematic analysis of organic compounds are also performed.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 6 DSE Paper 3 POLYMER CHEMISTRY (FM 40)	Unit 1: Introduction and history of polymeric materials	Students will learn about the followings Definition ,nomenclature and classification of polymers
			Unit2: Functionality and it's importance	Students will learn about the followings • Mechanism of addition and condensation polymerization • Relationships between functionality, extent of reaction and degree of polymerization

			Unit3: : Kinetics of polymerization	Students will learn about the followings • Kinetics of polymerization • Application of Ziegler Natta catalyst • Preparation and characteristics of thermoplastic and thermosetting polymer.
			Unit4: Determination of molecular weights of polymer	Students will learn about the followings • Different ways of determination of molecular weights and their significances.
			Unit5: Properties of polymers	Students will learn about the followings Physical, thermal and mechanical properties of polymers
			Unit6:Brief introduction to preparation, structure, properties and applications of different polymers	Students will learn about the followings • Preparation • Structure • Properties • application
			Unit7:Rubber	Students will learn about the followings • Natural rubber • Synthetic rubber • Vulcaniztion
		SEMESTER – 6 DSE Paper 3 PRACTICAL	POLYMER CHEMISTRY PRACTICAL	Students will learn about the followings • Preparation and purification of IPC • Preparation of urea-formaldehyde resin • Preparation of phenol-formaldehyde resin • Determination of molecular weight of polymer by viscometry • Project work on Polymers
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER - 6 DSE Paper 4 INDUSTRIAL CHEMICALS AND ENVIRONMENTS (FM 40)	Unit 1: Industrial gases and Inorganic chemicals	Students will learn about the followings • Large scale production, uses, storage and hazards in handling of different industrial gases Manufacture, application, analysis and hazards in handling of different inorganic chemicals

			Unit 2: Environments and it's segments	Students will learn about the followings • Ecosystems and Biochemical cycles of carbon , nitrogen and sulphur Reason and impacts of air pollution, water pollution and soil pollution
			Unit 3: Energy and environment	Students will learn about the followings • Different types of non conventional sources of energy • Nuclear pollution
		SEMESTER – 6 DSE Paper 4 PRACTICAL	INDUSTRIAL CHEMICALS &ENVIRONMENTS PRACTICALS	Students will learn about the followings • Estimation of total alkalinity of water samples • Measurements of dissolved CO2 • Estimation of SPM • Preparation of Borax

COURSE OUTCOME – GE (CBCS SYSTEM): CHEMISTRY

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
B. Sc	2018	COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 1 GE 1 PAPER 1 (Group-A) INORGANIC CHEMISTRY	Atomic Structure	Students learn structure of atom covering Bohr's theory. They also learn Hydrogen atom spectra. Wave-Particle duality is covered by illustrating de Broglie's relation, Heisenberg Uncertainty principle.
			Chemical Bonding and Molecular Structure	Students acquire knowledge on ionic bonding, covalent bonding. Lattice energy and solvation energy are intensely covered. VB theory and MO theory are explicitly understood by learners.
		SEMESTER - 1 GE 1 PAPER 1 (Group-B) – [ORGANIC CHEMISTRY]	Fundamentals of Organic Chemistry	Students learn basic features relating to organic chemistry. In this section, they understand basic matters like Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. In addition reaction intermediates, varieties of reagents and reaction mechanism are taught comprehensively.
			Stereochemistry	Students learn orientation of molecules in three dimensional space. In this unit concept of chirality and related matters are explicitly covered.
			Aliphatic hydrocarbon	Students learn chemistry of hydrocarbon family. They can differentiate alkane, alkene and alkyne by covering this unit.
		SEMESTER - 1 GE 1 PAPER 1 (Group-A) INORGANIC CHEMISTRY PRACTICAL	Experiment based on Volumetric Analysis and	Students learn estimation of oxalic acid by titrating it with $KMnO_4$ Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. Cu (II) ions iodometrically using $Na_2S_2O_3$
		SEMESTER – 1 GE 1 PAPER 1 (Group-B)- [ORGANIC	Experiment based on Detection of extra elements and chromatographic analysis	Students identify presence of extra elements by authentic chemical tests. They also come to know analysis of trace amount of amino acids by chromatographic method.

		CHEMISTRY PRACTICAL]		

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 2 GE 1 PAPER 2 (Group- A) – [PHYSICAL CHEMISTRY]	Chemical Energetics	Students learn the Laws of Thermodynamics Relation between Cp and Cv, Joule-Thomson Experiment, Inversion of Temperature are understood by them. They come to know Chemical Equilibrium and various factors related to ionic equilibrium.
		SEMESTER – 2 GE 1 PAPER 2 (Group- B) ORGANIC CHEMISTRY	Organic Chemistry	Students learn about benzene, phenols, Alkyl Halides, Aryl Halides, Alcohols, Phenols and Ethers etc. elaborately.
NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 2 GE 1 PAPER 2 (Practical) SECTION A: Physical Chemistry SECTION B: Organic Chemistry	Experiments based on heat capacity Measurement of pH of different solutions Buffer solution	Students learn To measure heat capacity To measure pH of different solutions. To prepare buffer solution.
			Experiments based on Purification of organic compounds. And Organic synthesis	Students learn recrystallization process. They carry out different hands on experiments like Condensation reactions, Acetylation and Benzoylation of phenols and amines.
		SEMESTER – 2 GE 1 PAPER 2 (Group- C) PRACTICAL		

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 GE 2 PAPER 1 SECTION A: PHYSICAL CHEMISTRY (FM 40)	Solution	Students will learn about the followings • Raoult's law about lowering of Vapour pressure,Osmotic pressure. • Ideal and non ideal solution • Distillation of solution • Nernst distribution law
			Phase Equilibria	Students will learn about the followings • Phase rule, degrees of freedom • Clausius Clapeyron equation • Phase diagrams
			Conductance	Students will learn about the followings • Specific and equivalent conductance • Kohlrausch law • Hydrolysis constants • Salt hydrolysis
			Electrochemistry	Students will learn about the followings • Cell EMF • Nernst equation • Potentiometric titration

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 GE 2 PAPER 1 (Group-A) PRACTICAL	Conductance and Potentiometric titration	Students will learn about the followings • Determination of conductometric end point • Determination of potentiometric end point
		SEMESTER – 3	Carboxylic acids and their derivatives	Students will learn about the followings

		GE 2 PAPER 1 (Group-B) – Organic Chemistry		• Preparation and properties of carboxylic acids and derivatives
			Amines and Diazonium salts	Students will learn about the followings • Preparation and properties of Amines and diazonium salts
			Amino acids, peptides and proteins	Students will learn about the followings • Preparation and properties of Amino acids • Preparation and properties of peptides • Structure and importance of proteins • Structure , Classification and importance of carbohydrates

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 3 GE 2 PAPER 1 (Group-B) PRACTICAL	Organic Lab	Students will learn about the followings • Detection of functional group present in organic sample

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 4 GE 2 PAPER 2 SECTION A: INORGANIC CHEMISTRY	Transition Elements	Students will learn about the followings • General electronic configuration, • General properties • Latimer diagram

			Lanthanoids contraction	Students will learn about the followings • Reason and impacts of lanthanoids contraction
			Coordination Chemistry	Students will learn about the followings • VBT • IUPAC nomenclature • Structural isomerism
			Crystal Field theory	Students will learn about the followings • CFSE • Spectrochemical seriese • Oh and Td complexes • Jahn-Teller distortion
		SEMESTER – 4 GE 2 PAPER 2 (Group- A) PRACTICAL	Inorganic Lab	Students will learn about the followings • Salt analysis via radicals detection

NAME OF THE PROGRAMME	YEAR OF INTRODUCTION	COURSE OUTCOME		
		COURSE	COURSE NAME	COURSE OUTCOME
		SEMESTER – 4 GE 2 PAPER 2 SECTION B:Physical Chemistry	Gases	Students will learn about the followings • Kinetic theory and kinetic gas equation • van der Waals gas equation • Maxwell equation • Collision frequency
			Liquids	Students will learn about the followings • Surface Tension and it's determination • Viscosity coefficient and it's determination
			Solids	Students will learn about the followings • Laws of Crystallography • Miller indices • X-ray diffraction • Bragg's equation

			Chemical Kinetics	Students will learn about the followings • Order and molecularity of reaction • Determination of order • Arrhenius equation • Collision theory • Activated complex theory
		SEMESTER – 4 GE 2 PAPER 2 (Group- B) PRACTICAL	Physical Lab	Students will learn about the followings • Determination of surface tension • Determination of viscosity • Kinetics of acid hydrolysis reactions