GOKUL GLOBAL UNIVERSITY

Approved By Govt. of Gujarat
(Recognized by UGC under Section 22 & 2(f) of 1956)
(Gujarat Private State University Act 4 of 2018)

COURSE STRUCTURE

Master of Science

Chemistry

Faculty of Science
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M.SC SEMESTER - 1										
Subject Code	**Subject Name**	**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**		**Tutorial / Practical Marks**		**Total Marks**
		Theory	Tutorial	Practical		ESE	IA	CSE	Viva	
MCHE101UDSC	Inorganic Chemistry	60	0	0	4	70	20	10	0	100
MCHE102UDSC	Organic Chemistry	0	0	180	4	200	0	0	200	400
MCHE103UDSC	Physical Chemistry	30	0	0	4	35	10	5	0	50
MCHE104UDSC	Analytical Chemistry	60	0	0	4	70	20	10	0	100
MCHE101UPRA	Chemistry Practical	60	0	0	6	70	20	10	0	100
MCHE101USE	Spectroscopy and Diffraction method/ Photoinorganic Chemistry	60	0	0	2	70	20	10	0	100

M.SC SEMESTER - 2										
Subject Code	**Subject Name**	**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**		**Tutorial / Practical Marks**		**Total Marks**
		Theory	Tutorial	Practical		ESE	IA	CSE	Viva	
MCHE201UDSC	Inorganic Chemistry	60	0	0	4	70	20	10	0	100
MCHE202UDSC	Organic Chemistry	0	0	180	4	200	0	0	200	400
MCHE203UDSC	Physical Chemistry	30	0	0	4	35	10	5	0	50
MCHE204UDSC	Analytical Chemistry	60	0	0	4	70	20	10	0	100
MCHE201UPRA	Chemistry Practical	60	0	0	6	70	20	10	0	100
MCHE201USE	Biology for Chemist/ Computational Chemistry	60	0	0	2	70	20	10	0	100

M.SC SEMESTER - 3										
Subject Code	**Subject Name**	**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**		**Tutorial / Practical Marks**		**Total Marks**
		Theory	Tutorial	Practical		ESE	IA	CSE	Viva	
MCHE301UDSC	Natural Products	60	0	0	4	70	20	10	0	100
MCHE302UDSC	Medicinal Chemistry-I	0	0	180	4	200	0	0	200	400
MCHE303UDSC	Industrial Chemistry-I	30	0	0	4	35	10	5	0	50
MCHE304UDSC	Advanced Organic Chemistry-I	60	0	0	4	70	20	10	0	100
MCHE301UPRA	Chemistry Practical	60	0	0	6	70	20	10	0	100
MCHE301USE	Environmental Chemistry/ Research Methodology	60	0	0	2	70	20	10	0	100

M.SC SEMESTER - 4										
Subject Code	**Subject Name**	**Teaching Scheme (Hours)**			**Credits**	**Theory Marks**		**Tutorial / Practical Marks**		**Total Marks**
		Theory	Tutorial	Practical		ESE	IA	CSE	Viva	
MCHE401UDSC	Heterocyclic Chemistry and Organic Reaction Mechanism	60	0	0	4	70	20	10	0	100
MCHE402UDSC	Medicinal Chemistry-II	0	0	180	6	200	0	0	200	400
MCHE403UDSC	Industrial Chemistry-II	30	0	0	2	35	10	5	0	50
MCHE404UDSC	Advanced Organic Chemistry-II	60	0	0	4	70	20	10	0	100
MCHE401UPRA	Chemistry Practical	60	0	0	4	70	20	10	0	100
MCHE401USE	Organometallic Compounds/ Nano Chemistry	60	0	0	4	70	20	10	0	100

Subject Code: MCHE101UDSC **Semester: I**

Subject Name: INORGANIC CHEMISTRY **Faculty Name/s:**

Credit : 04

Unit	Content	Hrs.	Weightage
1	**Stereochemistry and bonding in main group compounds**	15	25%
	VSEPR, Walsh diagrams (tri and penta - atomic molecules), dπ-pπ bonds, Bent rule and energetic of hybridization, some simple reactions of covalently bonded molecules.		
2	**Electronic spectra and magnetic properties of transition Metal complexes**	15	25%
	Spectroscopic ground state, correlation, Tanabe sugano diagram for transition metal complexes(d^1-d^9) state, calculation of Dq, B and β parameters, charge transfer spectra, spectroscopic assignment of absolute configuration in optically active metal chelates and their spectrochemical information, anomalous magnetic moment, magnetic exchange coupling and spin cross over.		
3	**Symmetry of Molecules**	15	25%
	Symmetry elements & symmetry operations, multiplications of symmetry operations, multiplication table for C_{2v}, C_{3v}, C_{2h} point groups only, Classifications of schoonflies point groups, Determination of schoonflies point groups notations, Symmetry & optical activity, Symmetry property of orbital's for C_{2v}, C_{3v}, C_{2h} point groups.		

Course Outcomes: At the end of the course, students shall be able to

CO1	Student after learning this course can seek employment in areas of Metallurgy Firms, Hospitals, Educational Institutes etc. as Junior Scientist, Assistant Professor, Content Developer, Process Engineer, Site Engineer, and Researcher etc.
CO2	This course opens a wide range of job opportunities such as in research, development, or production in the chemical process industries or to undertake research or teaching certificates.
CO3	Candidates also hold the opportunity to explore the industrial, pharmaceutical, technological and commercial fields of chemistry as the course basically concentrates on the uses of chemistry in modern society.
CO4	The employment areas of Inorganic Chemistry include Chemicals Manufacturing Companies, Industrial Laboratories, Medical Research, Oil Industry etc.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**			
CO2	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**			
CO3	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**			
CO4	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**3**	**3**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE102UDSC **Semester: I**
Subject Name: ORGANIC CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**Reaction Mechanism: Structure and Reactivity**	15	25%
	Types of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle, Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotope effects. Hard and soft acids and bases, Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes, Effect of structure on reactivity - resonance and field effects, steric effect, quantitative treatment, the Hammett equation and linear free energy relationship, substituent and reaction constants, Taft equation.		
2	**Nature of Bonding in Organic Molecules**	15	25%
	Delocalized chemical bonding: Conjugation, Cross conjugation, resonance, hyper conjugation, bonding in fullerenes, tautomerism, Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel's rule, energy level of pi-molecular orbitals, annulenes, anti-aromaticity, homo-aromaticity, PMO approach, Bonds weaker than covalent- addition compounds, crown ether complexes and cryptands, inclusion compounds, cyclodextrins, catenanes and rotaxanes.		

Course Outcomes: At the end of the course, students shall be able to

CO1	Apply the concepts of bonding, resonance, aromaticity, hyperconjugation and tautomerism to higher organic compounds.
CO2	Predict the products, identify reaction intermediates and propose suitable mechanism for organic reactions
CO3	Identify stereo geniccenters, recognize enantiomers, diastereomers, meso compounds, draw stereochemical structures, and provide R/S designations of stereocenters
CO4	Draw stable conformations for substituted cyclic compounds, fused and bridged rings.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**2**	**2**
CO3													**2**	**2**
CO4													**2**	**2**
CO5														

Subject Code: MCHE103UDSC **Semester: I**
Subject Name: PHYSICAL CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**Electronic Structure of Atoms and Molecular Orbital Theory**	15	25%
	Electronic configuration, Russell-Saunders terms and coupling schemes, Slater-Condon parameters, term separation energies of the pn configuration, term separation energies for the dn configurations, magnetic effects, spin-orbit coupling, Huckel theory of conjugated systems, Applications to butadiene. Introduction to extended Huckel theory.		
2	**Solid State Chemistry**	15	25%
	Bonding in solids and electronic structure in solids, bond theory-metals, semiconductors and insulators, defects in crystals, calculation of scottky and Frenkel defects using statistical method, non Stoichiometry, solid electrolytes, diffusion in solids, electrical conductivity in solids, super conductivity, perovskites.		
3	**Chemical thermodynamics**	15	25%
	Nernst heat theorem and its applications to gaseous system, third law of thermodynamics and its applications to evaluate absolute entropies of solids, liquids and gases; partial molar quantities and their determination, Gibbs-Duhem equation, chemical potential, chemical potential of idea gases and solutions, Raoult's law, real solutions, free energy, methods of determination of activity and activity co-efficient, fugacity of gases and liquids and methods of its determination, Non equilibrium thermodynamics-basic concepts.		

Course Outcomes: At the end of the course, students shall be able to

CO1	Student after learning this course can be introduced about the Huckel theory of conjugated systems.
CO2	Learn the calculation of scottky and Frenkel defects using statistical method.
CO3	Understand the Nernst heat theorem and its applications to gaseous system.
CO4	Study the fast reactions by flow method, relaxation method, flash photolysis and nuclear magnetic resonance method.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO2	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**2**
CO4													**3**	**3**
CO5														

Subject Code: MCHE104UDSC **Semester: I**
Subject Name: ANALYTICAL CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**Analytical Objectives Data Handling and Good Laboratory Practice (GLP)** Scope of analytical science and its literature, qualitative and quantitative analysis, ways to express accuracy and precision, types of errors and their causes; significant figures, control charts, confidence limit, test of Platinum II complexes, the trans effect, theories of trans effect, significance, rejection of a result- the Q-test. GLP- standard operating procedures, quality assurance and quality control, validation of analytical methods.	12	25%
2	**Sampling and Calibration Methods** Definition, Types of Organometallic Compounds, Classification, Nomenclature of O.M.C., Structure and bonding in dihapto and metal policies complexes; e.g. Zeise's salt complexes, ferrocene structure, O.M.C. of Li and Al complexes.	11	25%
3	**Corrosion** Principle of Corrosion, Types of Corrosion: Wet corrosion, Galvanic corrosion, Atmospheric corrosion, Pitting corrosion, Inner granual corrosion, Dezincification, Prevention of Corrosion: Inhibitors- Definition, type and use of inhibitors.	10	25%
4	**Sample Preparation Techniques** Liquid-liquid extraction/solvent extraction-partition co-efficient, Distribution ratio and percent extraction, solvent extraction of metal ions-ion association complexes and metal chelates, multiple batch extraction, Craig's counter-current distribution, accelerated and microwave assisted extraction, protein precipitation and solid phase extraction (SPE).	12	25%

Course Outcomes: At the end of the course, students shall be able to

CO1	Organize, analyze and interpret data using the tools learned in an ethically responsible approach and present it systematically.
CO2	Describe and adopt suitable separation techniques.
CO3	Interpret data obtained from optical and thermal methods of chemical analysis.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO2	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**2**	**2**			
CO3	**3**	**3**	**2**	**1**	**2**	**2**	**1**	**1**	**2**			
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**3**	**3**
CO3													**3**	**3**
CO4														
CO5														

Subject Code: MCHE101USE **Semester: I**
Subject Name: SPECTROSCOPY & DIFFRACTION METHOD **Faculty Name/s:**
Credit : 02

Unit	Content	Hrs.	Weightage
1.	**Unifying Principles** Electromagnetic radiation, interaction of electromagnetic radiation with matter – absorption, emission, transmission, reflection, dispersion, polarization and scattering, Uncertainty relation and natural line width and natural line broadening, Transition probability, results of the time dependent perturbation theory, transition moment, selection rules, intensity of spectral lines, Born-Oppenheimer approximation, rotational, vibrational and electric energy levels.	**15**	**50%**
2.	**X-ray Diffraction** Bragg Condition, Miller indices, Laue method, Bragg method, Debye-Scherrer method of X-ray structural analysis of crystals, index reflections, Identification of unit cells from systematic absences in diffraction pattern, Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem, Description of the procedure for an X-ray structure analysis, absolute configuration of molecules, Ramchandran diagram.	**15**	**50%**

Course Outcomes: At the end of the course, students shall be able to

CO1	Student after learning this course can seek employment in areas of Metallurgy Firms, Hospitals, Educational Institutes etc. as Junior Scientist, Assistant Professor, Content Developer, Process Engineer, Site Engineer, and Researcher etc.
CO2	This course opens a wide range of job opportunities such as in research, development, or production in the chemical process industries or to undertake research or teaching certificates.

CO3	Candidates also hold the opportunity to explore the industrial, pharmaceutical, technological and commercial fields of chemistry as the course basically concentrates on the uses of chemistry in modern society.
CO4	The employment areas of Inorganic Chemistry include Chemicals Manufacturing Companies, Industrial Laboratories, Medical Research, Oil Industry etc.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**2**			
CO2	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**			
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**2**			
CO4	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**3**	**3**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE201UDSC **Semester: II**
Subject Name: INORGANIC CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**Metal-Ligand Equilibrium solution** Limitation of crystal field theory, molecular orbital theory, octahedral, tetrahedral and square planar complexes, π-bonding and molecular orbital theory. Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by pH-metry and spectrophotometry.	12	30%
2	**Reaction Mechanism of Transition Metal Complexes** Energy profile of a reaction, reactivity of a metal complexes, inert and labile complexes, kinetic application of valence bond and crystal field theories, kinetic of octahedral substitution, acid hydrolysis, factor affecting the acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favor of conjugated mechanism, anation reaction, reaction without metal ligand bond cleavage. Substitution reaction in square planar complexes, the trans effect. Mechanism of the substitution reaction, redox reaction, electron transfer reaction, mechanism of one electron transfer reaction, outer sphere type reaction, cross reaction and Marcus –Hush theory, inner sphere type reaction.	12	30%
3	**Mossbauer Spectroscopy** Basic applications of Mossbauer spectroscopy, hyperfine structure, quadruple splitting, instrumentation and applications of Mossbauer spectroscopy, problems related to Mossbauer spectra.	10	20%

4	**Bio-inorganic Chemistry** Metalloporphyrins (enzymes) definition, hemoglobin and myoglobin, cytochrome, vitamin B12 (cyanocobalamin), zincmetalloenzymes, nitrogen fixation, essential and trace elements in biological system, biochemistry of non-metals K, Na pump (action of bath ions), toxic metals and their toxicity. Co-ordination compounds in medicine.	**11**	**20%**

Course Outcomes: At the end of the course, students shall be able to

CO1	To give the students a thorough knowledge of the different theories to explain the bonding in coordination compounds.
CO2	To improve the level of understanding of the chemistry of organometallic compounds, metal carbonyls and metal clusters.
CO3	To give knowledge about some bioinorganic compounds and compounds of various block elements.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	**Program Outcomes**											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**2**			
CO2	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**			
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**2**	**1**
CO2													**2**	**1**
CO3													**2**	**1**
CO4													**2**	**1**
CO5														

Subject Code: MCHE202UDSC **Semester: II**
Subject Name: ORGANIC CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**(A)Aromatic Electrophilic Substitution** The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrate and electrophiles. Diazonium coupling, Vilsmeir reaction, Gattermann- koch reaction. **(B)Aromatic Nucleophilic Substitution** The SNAr, SN^1, benzyne and SRN1 mechanism. Reactivity-effect of substrate structure, leaving group and attacking nucleophile. The von Richter, Sommelet-Hauser and Smiles rearrangement.	12	25%
2	**Reagents in Organic Synthesis [Oxidation]** CrO_3, MnO_2, $KMnO_4$, SeO_2,$Pb(OAc)_4$, OsO_4, HIO_4, DMSO, H_2O_2, CH_3COOAg (Dry & wet),RCOOOH, Ozone, HgO, NBS, $K_3Fe(CN)_6$, DDQ, $Al(O\text{-}t\text{-}Bu)_3$; Some Miscellaneous Reagents in Organic Synthesis : LDA, Sharp less epoxidation, Wilkinson catalyst, Grignard Reagent and Gilman reagent.	12	25%
3	**Reagents in Organic Synthesis [Reduction]** Al $(O\text{-}iPr)_3$, Zn/HCl, N_2H_4/OH, $NaBH_4$, $LiAlH_4$, Complex Hydrides, Na/NH_3, Cat.H_2 ,TBTH. Introduction to Green Chemistry, Basic Principles of Green Chemistry, Importance of PTC, ILs, microwave and ultrasonication in green synthesis.	10	25%
4.	**Pericyclic Reaction** Molecular orbital symmetry, Frontier orbital of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system. Classification of Pericyclic reactions. Woodwards-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions-conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems	11	25%

	Cyclo addition antrafacial and suprafacial addition, 4n, 4n+2 systems, 2+2 addition of ketenes, 1,3 dipolar cyclo additions and cheleotropic reactions. Sigmatropic rearrangement – suprafacial and antrafacial shifts of H sigmatropic shifts involving carbon impieties, 3, 3 and 5,5- sigmatropic rearrangements. Claisen, cope and azacope rearrangement. Fluxional tautomerism, Ene reaction.		

Course Outcomes: At the end of the course, students shall be able to

CO1	To impart the students thorough knowledge about the mechanisms of reactions of some selected functional groups in organic compounds and also to give an outline of applied organic chemistry and the applications of organic chemistry in various spheres of chemical sciences.
CO2	To give an elementary idea of chemotherapy, organic compounds like carbohydrates, dyes and heterocyclic compounds.
CO3	To study the fundamentals of terpenoids, alkaloids, vitamins, lipids and steroids.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**2**
CO4													**3**	**2**
CO5														

Subject Code: MCHE203UDSC **Semester: II**
Subject Name: PHYSICAL CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**Statistical Thermodynamics** Concepts of distribution of molecules, thermodynamic probability, permutations and combinations, Boltzmann's most probable distribution, partition function - translational, vibrational, rotational, electronic nuclear partition functions.	10	25%
2	**Electrochemistry** Debye-Hackle Theory (Mathematical Derivation), Thermodynamics of electrified interfaces Lipmann's Equation, Determination of dissociation constant of mono basic acids by conductometry and potentiometry, Gouy-Chapman Theory, Polarization and Overvoltage, Bulter-Volmer equation, Principle of polarography, Equation of polarographic wave, Ilkovic equation.	12	25%
3	**Surface Chemistry** Adsorption Surface tension, capillary action, pressure deference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation), and surface films on liquids. Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMS), factors affecting the CMC of surfactants, counter ion binding to micelles.	12	25%
4	**Macromolecules** Polymer – definition, types of polymers, electrically conductiong, fire resistant, liquid crystal polymers, kinetics of free radical chain polymerization, mechanism of polymerization. Molecular mass, number and mass average molecular mass, molecular mass determinations (osmometry, viscometry, diffusion and light scattering methods), size of macromolecules.	11	25%

Course Outcomes: At the end of the course, students shall be able to

CO1	Student after learning this course can be introduced about the Electrochemistry.
CO2	Learn the molecular mass determinations (osmometry, viscometry, diffusion and light scattering methods).
CO3	Understand the Concepts of distribution of molecules.
CO4	Study about the Principle of polarography.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**			
CO2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**2**	**3**
CO3													**2**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE204UDSC **Semester: II**
Subject Name: ANALYTICAL CHEMISTRY **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1	**Fundamentals of Spectrophotometry and UV-Visible Spectroscopy** Various electronic transition(185-800nm),Beer-lambert law effect of solvent on electronic transition, Ultraviolet bands of carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes, Fiesher- Woodwords rule for conjugated dienes and carbonyl compounds, UV spectra of aromatic and heterocyclic compounds, Steric effects in biphenyls. **Numerical**	12	25%
2	**Infrared Spectroscopy** Instrumentation and sampling, Characteristic vibration frequencies of alkanes, alkenes, alkynes, compounds, alcohols, ethers, phenol and amines. Detailed studies of frequencies of carbonyl compounds. (ketons,aldehydes,esters.acids,amides,anhydrides,lactones,lactams and conjugated carbonyl compounds)effect of hydrogen bonding and effect of solvent on vibrational frequencies, overtones, combinations bands and Fermi resonance, FTIR, IR of gaseous, solids and polymeric materials. **Numerical**	11	25%
	Fundamental of NMR & CMR Spectroscopy	12	30%

3	1H NMR Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, de-shielding, spin spin interactions, factors influencing coupling constant 'j'. Classification (ABX, AMX, ABC, A2B2 etc.) spin decoupling; basic ideas about instrument. Advantages of FT NMR use of NMR in medical diagnostics. Principal, basic of NMR (Peak height, Peak signal, Chemical shift) instrumentation and applications of NMR, Criteria for a compound to be NMR active. Basic components of instrumentation of PMR and CMR. Shielding, de-shielding, and splitting. **Numerical**		
4	**Examples of UV, IR and NMR Spectroscopy** **Numerical**	**10**	**20%**

Course Outcomes: At the end of the course, students shall be able to

CO1	To impart students a broad outline of the methodology of science in general and Chemistry in particular.
CO2	The students will learn the important analytical and instrumental tools used for practicing chemistry.
CO3	To develop skills required for the qualitative analysis of organic compounds, determination of physical constants.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	**Program Outcomes**											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**			
CO2	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**3**	**3**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE201USE **Semester: II**
Subject Name: BIOLOGY FOR CHEMIST **Faculty Name/s:**
Credit : 02

Unit	Content	Hrs.	Weightage
1	**Carbohydrates** Conformation of monosaccharide, structure and functions of important derivatives of monosaccharide like glycosides, deoxy sugars, myoinusitol, amino sugars, N-acetylmuramic acid, Sailic acid, disaccharides and polysaccharides, Structural polysaccharides - cellulose and chitin. Storage polysaccharides - starch and glycogen Structure and biological functions or glucosaminoglyeans or mucopolysaccharides. Carbohydrates of glycoprotein and glycolipids. Role of sugars in biological recognition. Blood group substances, Ascorbic acid, Carbohydrate metabolism, Kreb's cycle, glycolysis, glycogenesis and glycogenolysis, gluconeogenesis, pentose phosphate pathway.	**15**	**50%**
2	**Amino Acids and Nucleic Acids** Amino acid metabolism - degradation and biosynthesis of amino acids, sequence determination: chemical/enzymatic/mass spectral. Racemization/detection, Chomistry oxytocin and tryptophan releasing hormone (TRH). Purine and Pyrimidine bases of nucleic acids, base pairing via H-bonding, Structure of Ribonucleic acids (RNA) and Deoxyribonucleic acids (DNA), double helix model of DNA and forces responsible for holding it, Chemical and enzymatic hydrolysis of nucleic acids, The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code, Chemical synthesis of mono and tri nucleoside.	**15**	**50%**

Course Outcomes: At the end of the course, students shall be able to

CO1	A student can also become enlightened about food science, nanomaterials, drugs, plastics, dyes and paper.

CO2	To give an elementary idea of chemotherapy, organic compounds like carbohydrates, dyes and heterocyclic compounds.
CO3	To study the fundamentals of terpenoids, alkaloids, vitamins, lipids and steroids.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**			
CO2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**			
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**2**	**2**
CO3													**2**	**2**
CO4													**3**	**2**
CO5														

Subject Code: MCHE301UDSC **Semester: III**
Subject Name: NATURAL PRODUCTS - I **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Natural Colouring Matter** Classification General method of structural determination, biosynthesis studies of Anthocyanine (cynin and palargonidin), Flavones (chrysin), Flavonols (Quercetin), Flavonone (Dihydro Flavones) and isoflavones (Daidzein), Coumarin, Quinones (polyporic acid), porphyrin, Chemistry of Haemin and chlorophyll.	15	25%
2.	**Terpenoids** Chemistry of Camphor, Chemistry of Zingiberene, Chemistry of Carotenes, Biosynthesis study of Tri-Terpenoids and Tetra Terpenoids.	15	25%
3.	**Vitamins** Details study of chemistry of Thiamine (Vitamin-B_1), Pantothenic acid (Vitamin-B_2), Ascorbic acid (Vitamin-C), and Tocopherol (Vitamin-E), and Pyridoxine (Vitamin-B_6), Biological importance of Vitamin.	15	25%
4.	**Alkaloids** General Biogenetic studies of Alkaloids, Chemistry of Reserpine, Colchicines, Strychnine and Narcotine.	15	25%

Course Outcomes: At the end of the course, students shall be able to

CO1	The student will be able to relate different kind of natural vitamins and steroids.
CO2	They will be able to explain alkaloids & Terpenoids of a various group.

CO3	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO4	Apply the various procedures and techniques for the experiments.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO2	**3**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	**1**			
CO4	**3**	**3**	**1**	**2**	**2**	**1**	**1**	**1**	**2**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE302UDSC **Semester: III**
Subject Name: MEDICINAL CHEMISTRY- I **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Medicinal Chemistry** Introduction naming of organic medicinal compounds, Literature of medicinal chemistry, Classification of drugs, Drug design, Relation between molecular structure and biological activity(QSAR), Receptor site theory, Pharmacopeias, Indian standers, Modern methods of pharmaceutical Analysis Diagnostic Agents, Pharmaceutical acid: Solvents, Vehicles, Flavors, Suspending agents, Surfactants, Emulsifying agents.	**15**	**25%**
2.	**Antibiotics** Classification of Antibiotics, Synthesis and Activity of: Penicillin, Cephalosporin, Streptomycin, Amoxicillin, Neomycin, Chloroamphenicol.	**15**	**25%**
3.	**Sulpha drugs** Chemistry of Sulfonamides, Synthesis and uses: Sulphanilamides, Sulphafurazole, Sulphaguanidine, Sulphathiazole, Sulphamerazine, Sulphalene, Sulphathiadiazole, Trimethoprim.	**15**	**25%**
4.	**Stimulating Agents** Drugs stimulating or blocking the peripheral nervous system, Cholinergic & Anticholinergic drugs, Histamine and Antihistamine, Local Anesthetics.	**15**	**25%**

Course Outcomes: At the end of the course, students shall be able to

CO1	The student will be able to relate different kind of Antibiotics and Sulfa drugs.
CO2	They will be able to explain various Stimulating Agents of a various groups.

CO3	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO4	Apply the various procedures and techniques for the experiments.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO2	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**			
CO3	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO4	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE303UDSC **Semester: III**
Subject Name: INDUSTRIAL CHEMISTRY- I **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Unit Process and Unit Operation** Importance of unit process, Other various unit process, Industrial application of Nitration, Industrial application of Halogenation- Chlorination, Bromination, Iodination, Fluorination), Amination, Sulphonation.	15	25%
2.	**Agrochemicals** Insecticides, Fungicides, Weedicides, Rodenticides, Plant nutrients, plant hormones.	15	25%
3.	**Soap and detergents** Soap and its manufacture, Classification of surface-active agents, Anionic, Cationic, Non-Ionic Detergents, Amphoteric detergents, Miscellaneous compounds.	15	25%
4.	**Dyes** Colour and constitution, Fibers to be dyed, Classification of dyes, Application of the dyes, Methods of dyes, Methods of application.	15	25%

Course Outcomes: At the end of the course, students shall be able to

CO1	Student after learning this course can be introduced about the agrochemicals.
CO2	Learn the classification of surface-active agents.
CO3	Understand the methods and applications of dyes.
CO4	Study about the soap and detergents with their classification.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**2**			
CO2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**1**			
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**2**			
CO4	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**2**
CO4													**3**	**2**
CO5														

Subject Code: MCHE304UDSC **Semester: III**
Subject Name: ADVANCED ORGANIC CHEMISTRY- I **Faculty Name/s:**
Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Instrumental analysis** Liquid Chromatography: HPLC Instrumentation, Adsorption Chromatography, Partition Chromatography, Other Types of Liquid Chromatography, Gas Chromatography: Basic Description, Classification of GC Methods, Stationary Phase, Carrier Gas, Detectors, Temperature Programming, Thermal techniques: TGA, DTA, DSC. Application of ^{1}H NMR and ^{13}C NMR spectra.	15	25%
2.	**Name reactions (synthesis of alkene)** Shapiro reaction, Petersen synthesis, Julia olefination, cmurry reaction, Witting reaction, Corey-Fuches reaction, Appel reaction, DEAD reagent, Corey- winter, Tebbe reagent, Eschenmore fragmentation, Multi-component reactions: Ugi, Passerini, Biginelli and Mannich reactions, Ring formation reactions: Pausan-Khand, Bergman and Nazerov cyclization.	15	25%
3.	**Photochemistry** Photochemical reactions, Principle of energy transfer, electronic excitation (Janlonski diagram), Photosensitization, Photochemistry of carbonyl compounds, Norrish type-I and II, reaction of cyclic ketones, Peterno-Buchi reaction, Di-π methane rearrangement, Dinone photochemistry, Cis-trans Isomerization, Photochemistry of conjugated dienes, photo rearrangement, Barton reaction. Fluorescence chemistry and its application.	15	25%
	Elimination reactions	15	25%

4.	α, β and γ elimination reaction, regioselectivity of the elimination, E_1CB mechanism, E2 Mechanism, Hoffmann degradation of quaternary ammonium salt,dehalogenation, Ei mechanism, Chugave reaction, cope elimination, Pyrolysis of selenoxiden and sulphoxide, dehydration of aldoxime.		

Course Outcomes: At the end of the course, students shall be able to

CO1	The student will be able to relate different kind of Instrumental analysis and Elimination reactions. They will be able to explain various synthesis of alkene of a various group.
CO2	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO3	Apply the various procedures and techniques for the experiments.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	**Program Outcomes**											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**			
CO2	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO3	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**2**	**3**
CO3													**2**	**3**
CO4													**2**	**3**
CO5														

Subject Code: MCHE301USE **Semester: III**
Subject Name: ENVIRONMENTAL CHEMISTRY **Faculty Name/s:**
Credit : 02

Unit	Content	Hrs.	Weightage
1.	**Environment** Introduction, Composition of atmosphere, Vertical temperature, Heat budget of the earth atmospheric system, Vertical stability atmosphere, Biogeochemical cycles of C, N, P, S and O, Biodistribution of elements	15	50%
2.	**Hydrosphere** Chemical composition of water bodies-lakes, streams, rivers and wet lands etc., Hydrological cycle, Aquatic pollution- inorganic, organic, pesticide, agricultural, industrial and sewage, detergents, oil spills and oil pollutants, Water quality parameters-dissolved oxygen, biochemical oxygen demand, solids, metals, content of chloride, sulphate, phosphate, nitrate and micro-organisms, Water quality standards, Analytical methods for measuring BOD, DO, COD, F, Oils, metals(As, Cd, Cr, Hg, Pb, Se, etc.), residual chloride and chlorine demand, Purification and treatment of water.	15	50%

Course Outcomes: At the end of the course, students shall be able to

CO1	To create environmental awareness to understand the fragility and sensitivity of environment, in particular the biosphere and the importance of its protection.
CO2	This paper also gives elementary ideas on pesticides and fertilizers.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**			

CO2	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**			
CO3												
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**2**
CO4													**3**	**2**
CO5														

Subject Code: MCHE401UDSC **Semester: IV**

Subject Name: ORGANIC REACTION MECHANISM **Faculty Name/s:**

Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Heterocyclic Compounds (PART-A)** Introduction of Heterocyclic, Carbocyclic Chemistry, and Nomenclature of heterocyclic compounds, Nomenclature of Heterocyclic compounds Containing partial unsaturation, Compounds having More than one Hetero atom, Nomenclature of Identical system connected by single Bond, Naming of Heterocycles with fused rings, Naming of Bicyclic bridged structures.	15	25%
2.	**Heterocyclic Compounds (PART-B)** Heterocyclic compounds: Properties, Preparation and Chemical Reactions of Imidazole, Properties, Preparation and Chemical reactions of Oxazole, Properties, Preparation and Chemical reactions of Pyrimidine, Properties, Preparation and Chemical Reactions of Indole.	15	25%
3.	**Rearrangements & Uses of Selective Reagents:** Rearrangements: Reaction mechanism–nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements: 1. Baeyer-villager, 2. Wagner Meerwein, 3. Demjanov, 4. Neber, 5. Baker Venkatraman 6. Newman-Kwart. Uses of Selective Reagents: 1. Dess Martin Periodinane, 2. Sodium Cyanoborohydride, 3. Lithium di-isopropyl amide, 4. Crown ethers, 5. Dicyclohexylcarbodiimide, 6. Ceric ammonium nitrate, 7.	15	25%

	Wilkinson's catalyst.		

4.	**Synthesis based on Rearrangement and name reactions** Synthesis of compounds using Mannich reaction, Hofmann reaction, benzyl benzylic acid rearrangement, Pinacol-pinacolone rearrangement, reformatsky reaction, benzidine rearrangement etc. Multi steps synthesis: a) Phthalic anhydride – Phthalimide – Anthranilic acid. b) Acetophenone – Oxime – Acetanilide. c) Phthalic anhydride – o-benzoyl benzoic acid - anthraquinone. d) Aniline- Acetanilide- p-Nitro acetanilide-p-Nitroaniline-p- phenylenediamine e) Acetanilide – p-Bromo acetanilide – p-Bromoaniline. Other preparations based on theory.	**15**	**25%**

Course Outcomes: At the end of the course, students shall be able to

CO1	The student will be able to relate different kind of Antibiotics and Sulfa drugs.
CO2	They will be able to explain various Stimulating Agents of a various groups.
CO3	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO4	Apply the various procedures and techniques for the experiments.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**2**			
CO2	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**			
CO3	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**1**			
CO4	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE402UDSC **Semester: IV**

Subject Name: MEDICINAL CHEMISTRY-II **Faculty Name/s:**

Credit : 04

Unit	Content	Hrs.	Weightage
1.	**CNS Drugs or Psychopharmacological Agents** Antipsychotics, Antidepressant, Antianxiety, Anticonvulsants, Hallucinogenic Drugs, Antiparkinsonism Drugs, Sedative & Hypnotics, General Anaesthetics.	15	25%
2.	**Drugs Acting on the Cardiovascular Haemopoietic and Renal System** Cardiac Drugs, Diuretics, Anti-fungal agents, Antimalarial Drugs.	15	25%
3.	**Anti-Cancer Agents - I** Classification of Cancer, Phase of the cell-cycle, Structural activity relationship, Mechlorethamine, Chlorambucil, Melphalan, Cytoxan	15	25%
4.	**Anti-Cancer Agents - II** Antimetabolites (Methotixate, Purinitol), Antagonist (5-florouracine, Tamoxifen), Antibiotics (Mytomycin-C), Plants products (Paclitaxel, Chamtothesin).	15	25%

Course Outcomes: At the end of the course, students shall be able to

CO1	The student will be able to relate different kind of Antibiotics and Sulfa drugs.
CO2	They will be able to explain various Stimulating Agents of a various groups.

CO3	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO4	Apply the various procedures and techniques for the experiments.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**2**			
CO2	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**			
CO3	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**1**			
CO4	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**3**	**3**
CO4													**3**	**3**
CO5														

Subject Code: MCHE403UDSCSemester: IV

Subject Name: INDUSTRIAL CHEMISTRY- II **Faculty Name/s:**

Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Synthetic Industries based on Petroleum** Coal, petroleum, natural gas, organic chemicals from coal distillation refining of oil for industrial fuels, Textile fibers classification, Manufacture of important polyamide, Poly ester fiber.	15	25%
2.	**Industrial Paint and Varnish & Explosives** Classification of paints, Manufacture of paints, Methods of applying paints, Varnish- Raw materials, Manufacture of varnishes, types of varnishes, Types of Explosive, Characteristics of explosive, Industrial explosive.	15	25%
3.	**Industrial Polymers** Polyethylene – Introduction, Manufacture, Low- and high-density polyethylene, Co-polymers of ethylene and application, Monomers- Dacron, Orlon, Bakelite, Nylone-6,6, Teflon, polymer reaction, Hydrogenation, Addition and substitution aldehyde and ketonic group reaction, Acrylic Polymer Polyacrylated and polymethyl acrylate, poly acrylo nitrile.	15	25%
4.	**Home Products Science** Selected small scale industries, Safety matches, Agarbatties, Naphthalene balls, Carboxylic acid, Cyclohexane,2-Br-cyclohexanone, 2-Br-4-4-Dimethyl disinfectant, Soap, Detergents.	15	25%

Course Outcomes: At the end of the course, students shall be able to

CO1	Student after learning this course can be introduced about the Industrial Paint and Varnish & Explosives.
CO2	Learn the classification of paints.
CO3	Understand the Methods of applying paints
CO4	Study about home products science.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**			
CO2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO4	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**			
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3													**2**	**2**
CO4													**2**	**2**
CO5														

Subject Code: MCHE404UDSC **Semester: IV**

Subject Name: ADVANCED ORGANIC CHEMISTRY- II **Faculty Name/s:**

Credit : 04

Unit	Content	Hrs.	Weightage
1.	**Carbohydrates, Purine & Nucleic Acid** Type of Naturally occurring sugars, Amino sugars, Deoxy sugars, General method of structure and ring size determination with reference to starch and cellulose, photosynthesis of carbohydrates, Chemistry of Uric acid, Adenine, Caffeine, Structure of Nucleotides, Nucleosides DNA, RNA and Conformations, protein synthesis, Perbiotic chemistry.	15	25%
2.	**Conformational Analysis** Conformation of Cyclic System: Monocyclic compounds cyclopropane, cyclopropane 1,2-dicarboxylic acid, 2-OH-Methyl-1-cyclo propane dicarboxylic acid, 1,3-ditertiary butyl cyclohexene, 4-OH cyclohexene carboxylic acid, Cyclohexanone, 2-Br-cyclohexenone, 2-Br-4,4 dimethyl cyclopropane 1,2-dicarboxylic acid, 2-OH-methyl-1-cyclo propane carboxylic acid, Bridge ring system, Bicyclic (1,1,1) Pentane and Bicyclic (2,1,1) hexene, Bicyclo (2,2,1) heptane and Bicyclo (2,2,2) octane.	15	25%
3.	**Steroids** General Biosynthetic studies of steroids, chemistry of Ergosterol & Lanosterol, Oestrogens: - Oestrone, Oestriol, Oestradiol, Gestogens: - Progesterone, Adreno cortical hormones: - Cortisone, Diosgenin and its utility in hormone synthesis, Transformation in steroids molecules.	15	25%

4.	**Advances in NMR** Nuclear over Hauser effect, NMR shift reagents, Correlation Spectroscopy, Theory of H-HCOSY, DQF H: H COSY, H-^{13}C COSY, HET COR, HMBC, HMQC, TOCSY INADEQUATE.	**15**	**25%**

Course Outcomes: At the end of the course, students shall be able to

CO1	The student will be able to relate different kind of Instrumental analysis and Elimination reactions. They will be able to explain various synthesis of alkene of a various group.
CO2	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
CO3	Apply the various procedures and techniques for the experiments.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**			
CO2	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**			
CO3	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**			
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**3**
CO2													**3**	**3**
CO3													**3**	**3**
CO4														
CO5														

Subject Code: MCHE401USE **Semester: IV**

Subject Name: ORGANO METALIC COMPOUNDS **Faculty Name/s:**

Credit : 02

Unit	Content	Hrs.	Weightage
1.	**Compounds of Transition Metal-Carbon Multiple Bonds** Alkylidenes, Alkylidynes, Low valent carbenes and carbines-Synthesis, Nature of bond, Structural characteristics, Nucleophilic and electrophilic reactions on the ligands, Role in Organic synthesis, Transition metal compounds with bonds to Hydrogen.	15	50%
2.	**Transition Metal π-Complexes** Transition Metal π-complexes with unsaturated organic molecules, Alkenes, alkynes, allyl, diene, dienyl, arene and thienyl complexes, preparations, properties, nature of bonding and structural features, Important reactions relating to nucleophilic and electrophilic attack on ligands and to organic synthesis.	15	50%

Course Outcomes: At the end of the course, students shall be able to

CO1	To give the students a thorough knowledge of the different theories to explain the bonding in coordination compounds.
CO2	To improve the level of understanding of the chemistry of organometallic compounds, metal carbonyls and metal clusters.

CO-PO Competency and Program Indicators (PI)

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**1**			
CO2	**3**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**1**			
CO3												
CO4												
CO5												

CO-PO & CO-PSO Mapping

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													**3**	**2**
CO2													**3**	**2**
CO3														
CO4														
CO5														