Course No: CH18101CR
Title: Inorganic Chemistry (04 Credits)

Max. Marks: *100* ***Duration:*** *64 Contact hours*
Continuous Assessment: *20 marks* ***End Term Exam:*** *80 Marks*

Unit-I Stereochemistry and Bonding in the Compounds of Main Group Elements (16 Contact hours)

Valence bond theory: Energy changes taking place during the formation of diatomic molecules; factors affecting the combined wave function. Bent's rule and energetics of hybridization.

Resonance: Conditions, resonance energy and examples of some inorganic molecules/ions.

Odd Electron Bonds: Types, properties and molecular orbital treatment.

VSEPR: Recapitulation of assumptions, shapes of trigonal bypyramidal, octahedral and pentagonal bipyramidal molecules / ions. (PCl_5, VO_3^-, SF_6, $[SiF_6]^{2-}$, $[PbCl_6]^{2-}$ and IF_7). Limitations of VSEPR theory.

Molecular orbital theory: Salient features, variation of electron density with internuclear distance. Relative order of energy levels and molecular orbital diagrams of some heterodiatomic molecules /ions. Molecular orbital diagram of polyatomic molecules / ions.

Delocalized Molecular Orbitals: Butadiene, cyclopentadiene and benzene.

Detection of Hydrogen Bond: UV-VIS, IR and X-ray. Importance of hydrogen bonding.

Unit-II Metal-Ligand Equilibria in Solution (16 Contact hours)

Stepwise and overall formation constants (normal and abnormal trends). Mechanisms of selected Complexation processes, Inert & labile complexes. d^n configuration and lability, Stability of uncommon oxidation states.

Metal Chelates: Characteristics, Chelate effect and the factors affecting stability of metal chelates. Ligand preorganization, Macrocyclic effect Complexes of Crown ethers and Cryptands,

Determination of formation constants by pH- metry and spectrophotometry.

Structural (ionic radii) and thermodynamic (hydration and lattice energies) effects of crystal field splitting. Jahn -Teller distortion, spectrochemical series.

Unit-III Bonding in Coordination Compounds: (16 Contact hours)

Evidence of covalent bonding in transition metal complexes (Experimental Evidence in favor of Metal Ligand Orbital Overlap); Adjusted crystal field theory.

Molecular orbital theory of bonding in octahedral complexes:- composition of ligand group orbitals; molecular orbitals and energy level diagram for sigma bonded ML_6; Effect of pi-bonding. Molecular orbital and energy level diagram for bonding in Ferrocene, Square-planar and Tetrahedral complexes.

Unit-IV Pi-acid Metal Complexes (16 Contact hours)

Transition Metal Carbonyls: Carbon monoxide as ligand, synthesis, reactions, structures and bonding of mono- and poly-nuclear carbonyls. Vibrational spectra of metal carbonyls for structural diagnosis.

Prepration, reactions, structure and bonding of transition metal nitrosyls, dinitrogen and dioxygen complexes.

Tertiary phosphine as ligand.

Books Recommended

1. Principles of Inorganic Chemistry; 1st edn.; Brain W. Pfennig; Wiley; 2015.
2. Advanced Inorganic Chemistry; 5th. and 6th edn; F.A. Cotton , G. Wilkinson; Wiley; 1998/1999.
3. Inorganic Chemistry; 4th edn; J. E. Huheey; E. A. Keiter; Harper Collins; 2009.
4. Inorganic Chemistry; G. Wulfsberg; Viva; 2002.
5. Chemistry of the Elements; 2nd edn; N. N. Greenwood, A. Earnshaw; Butterworth; 1997.
6. Inorganic Chemistry; 3rd edn; D. F. Shriver; P. W. Atkins; Oxford; 1999.
7. Inorganic Chemistry; K.F. Purcell, J.C Kotz; Saunders; 1977.
8. Coordination Chemistry; D. Banerjea; Tata McGraw Hill; 1993.

Course No: CH18102CR
Title: Organic Chemistry (04 Credits)

Max. Marks: *100* ***Duration:*** *64 Contact hours*
Continuous Assessment: *20 marks* ***End Term Exam:*** *80 Marks*

Unit-I Delocalized Chemical bonding (16 Contact hours)

Overview: Inductive effect. Conjugation, Cross conjugation, Hyperconjugation–Isovalent and sacrificial hyperconjugations, Acids / Bases, Nucleophiles and Electrophiles. Resonance, Rules for writing resonance structures.

Tautomerism: Different types including valence tautomerism.

Aromaticity: Huckel rule and concept of aromaticity, Molecular orbital diagram of annulenes, Frost diagram. Relation between NMR and aromaticity. Anti and Homoaromaticity

Annulenes: Systems with π-electron numbers other than six (2,4,8,10 and more than ten π-electron systems), Aromaticity of hetero annulenes. Aromaticity in fused ring systems. Aromaticity of ferrocene and azulene. Carcinogenesis due to aromatic hydrocarbons.

Unit-II Reactive Intermediates and Determination of Reaction Mechanism (16 Contact hours)

Reactive Intermediates: Generation, Structure, fate and stability of Carbocations (Classical and Non- Classical), Carbanions, Free radicals, Carbenes, Nitrenes, Arynes and Radical ions.

Determination of Reaction Mechanism: Reaction Mechanism & Types of reactions. Determining reaction mechanism: Structure of Product, Transition states & Intermediates (Hammond postulate). Catalysis including acid and base catalysis, Specific acid and base catalysis. Fate of individual atoms (Isotope Labeling). Stereochemical course of reaction. Thermodynamic and kinetic evidences. Correlation of structure – reactivity.

Unit-III Stereochemistry: (16 Contact hours)

Chirality: Introduction, Chirality due to chiral centre. Molecules with more than one Chiral centres, Threo and erythro isomers. Convention for of assigning D, L & R, S configurations. Optical activity due to chiral axis, chiral plane and helicity. Chirality involving atoms other than carbon. Chirality in metallic complexes. Enantiotopic and diastereotopic atoms, groups and faces.

Asymmetric Synthesis: Introduction, principle of asymmetric synthesis. Categories of asymmetric synthesis, sterospecificity and steroselectivity of organic reactions.

Confirmations: Origin of conformational energy. Angle and Pitzer strain. Conformational analysis of cycloalkanes, and decalines. Effect of conformation on reactivity in acyclic and cyclic systems. Conformation of sugars & anomeric effect. Conformation of cyclohexene, cyclohexanones and bicycloheptane – a bridged system.

Unit-IV Aliphatic Nucleophilic Substitutions : (16 Contact hours)

Mechanism and stereochemical implications of S_N2, S_N1, S_Ni and Neighbouring Group Participation (by π and σ-bonds) reactions. Comparison of S_N1 and S_N2 reactions. Effect of substrate structure, attacking nucleophile, leaving group and solvent on the rates of S_N1 and S_N2 reactions. Mixed S_N1 and S_N2 reactions. Nucleophilic substitution at allylic, benzylic, aliphatic trigonal and vinylic carbons. Nucleophilic substitution in alcohols, Mitsunobu reactions. Nucleophilic substitutions on other elements. Functional group transformation using S_N2 reactions in organic synthesis. Nucleophilic substitutions in biological systems.

Elimination reactions: Factors affecting elimination reactions, Mechanism of E1, E2, E1cB and E2C reactions. Competition between substitution and elimination reactions. Stereochemistry and regioselectivity of E2 eliminations, Elimination in cyclic systems and vinyl halides. Mechanism and orientation in pyrolytic eliminations, Shapiro reaction.

Aliphatic Electrophilic Substitutions: General mechanism of S_E1, S_E2 and S_Ei reactions. Mechanisms of reactions involving migration of double bond. Effect of substrate, leaving group and solvent on reactivity. Stork-Enamine reaction.

Books Recommended:

1. March's Advanced Organic Chemistry Reactions, Mechanism and Structure, 6th Ed., Smith, M.B. (Wiley-2014)
2. Organic Chemistry 8th Ed. - F. A. Carey and Robert M. Giuliano (McGraw Hill-2012).
3. Reaction Mechanism in Organic Chemistry 3rd Ed., S.M. Mukherjee and S.P. Singh. (Macmillan-1998).
4. Stereochemistry of Organic Compounds 2nd Ed., D. Nasipuri. (New Age Inter.- 2008)
5. Stereochemistry of Carbon Compounds - E.L.Eliel. (TMH -2007)
6. Stereochemistry of Organic Compounds 7th Ed. - P.S. Kalsi. (New Age Inter.- 2012).
7. Organic Chemistry - 2nd Ed., J. Hornback. (Brooks/Cole- 2006,
8. Organic Chemistry, 5th Ed., John McMurry. (Brooks/Cole-2000).
9. Advanced Organic Chemistry, 5th Ed., F.A Carey & R.J Sundberg (Springer-2007).
10. Organic Chemistry, 2nd Ed., Jonathan Clayden (OUP-2012)
11. Organic Chemistry, 11th Ed., Solomons, T.W.G., (Wiley-2015).

Course No: CH18103CR

Title: Physical Chemistry (04 Credits)

Max. Marks: *100* ***Duration:*** *64 Contact hours*
Continuous Assessment: *20 marks* ***End Term Exam:*** *80 Marks*

Unit-I Quantum Chemistry (16 Contact hours)

Exact quantum mechanical results: Time-independent and time-dependent Schrodinger equation. Postulates of quantum mechanics. Operator concept, quantum mechanical operators in Cartesian and Spherical polar co-ordinate systems, some properties of quantum mechanical operators. Review of particle in a box problem. The solution of problems of harmonic oscillator & the rigid rotator. Tunneling effect.

Born-Oppenheimer approximation. Solution of the Hydrogen-like atom problem, radial and angular wave functions.

Unit-II Surface Chemistry (16 Contact hours)

Liquid Surface: Surface tension, pressure difference across curved surfaces (Laplace equation), vapor pressure of droplets (Kelvin equation), Capillary condensation.

Thermodynamics of Interfaces: Surface excess, surface tension and thermodynamic parameters, Gibbs adsorption isotherm.

Solid liquid interface: Contact angle, young's equation, wetting, Wetting as contact angle phenomena.

Solid surfaces: Adsorption at solid surfaces, adsorption models; Langmuir adsorption isotherm, BET adsorption isotherm and its use in estimation of surface area. Adsorption on porous solids.

Unit-III Chemical kinetics-I (16 Contact hours)

Fast reactions: General features of fast reactions, study of fast reactions by flow method, relaxation method and flash photolysis.

Theories of Chemical Reactions: Activated complex theory of reaction rates, statistical & thermodynamic formulations, comparison with collision theory. Theories of unimolecular reactions (Lindman, Hinshelwood , RRK and RRKM theories), Introduction to potential energy surfaces.

Chain reactions: Explosive reactions, Polymerization reactions (free radical, cationic and anionic)

Unit-IV Chemical kinetics-II (16 Contact hours)

Surface Reactions: Unimolecular & bimolecular surface reactions [Langmuir-Hinshelwood & Langnuir- Riedel mechanism], classical & statistical treatments.

Reactions in solutions: Effect of solvent on reaction rates, Diffusion controlled reactions (partial & full microscopic diffusion control), Ionic Reactions; Single & double sphere models of ionic reactions, effect of ionic strength.

Enzyme catalyzed Reactions: Kinetics of enzyme catalyzed reactions, Effect of substrate concentration, temperature and pH. Enzyme inhibition.

Structure Reactivity Relationships: Quadratic Free-Energy Relationships (QFER), Hammet and Taft relationships.

Books Recommended:

1. Physical Chemistry –P. W. Atkins, 9th Edition, ELBS , Oxford, 2009.
2. Physical Chemistry- A Molecular Approach - D. A. McQuarie & J. D. Simon, University Science Books, 1997.
3. Introduction to Quantum chemistry - A. K. Chandra, TataMcGraw Hill, 1997.
4. Quantum Chemistry - Ira. N. Levine, 7th Edition, Pearson, 2009.
5. Quantum Chemistry, R. K. Prasad, 2nd Edition, New Age Publishers, 2001.
6. Physics and Chemistry of Interfaces, H-J, Butt, K. Graf and M. Kappl, 2nd Edition, Wiley-VCH Verlag Gmbh and Co. KGaA, 2006.
7. Physical Chemistry of Surfaces, A. W. Adamson and A. P. Gast, 6th Edition, John Wiley and Sons, Inc. 1997.
8. Chemical Kinetics, K. J. Laidler, 3rd Edition, Pearson, 1987.
9. Chemical Kinetics and Reaction Dynamics, Paul L. Houston, Dover Publications, INC., Mineola, New York, 2001.
10. Chemical Kinetics and Dynamics, J. I. Steinfeld, J. S. Francisco, W.L. Hase, Prentice Hall, 1989
11. Chemical Kinetics and Catalysis, R.I. Masel, Wiley, 2001
12. Chemical Kinetics: From Molecular Structure to Chemical Reactivity, Luis G Arnaut, Sebastiao Jose Formosinho, Hugh Burrows, Elsevier, 2007.

Course No: CH18104CR
Title: Environmental Chemistry and Analytical Monitoring (02 Credits)

Max. Marks: *50* ***Duration:*** *32 Contact hours*
Continuous Assessment: *10 marks* ***End Term Exam:*** *40 Marks*

Unit-I Chemistry of the Environment (16 Contact hours)

Atmosphere: Vertical profile of the atmosphere; tropospheric reactivity patterns; stratospheric chemistry (Chapman mechanism and ozone depletion).

Chemistry and control of Green house effect, Acid rain and Photochemical smog.

Hydrosphere: Factors determining composition of water bodies (acid-base, thermal-stratification, pE concept and Pourbiax diagram).

Water quality parameters: Dissolved oxygen, metals (As, Cd, Hg, Pb and Se), chloride, phosphate and nitrate. Water quality standards.

Chemistry of water treatment: Chlorination, Ozonation and UV radiation.

Unit-II Analytical Environmental Monitoring (16 Contact hours)

Analytical methods for measuring air pollutants: General aspects, Sampling and methods of analyses.

Continuous monitoring instruments as analytical tools for real time monitoring of air pollutants (NDIR, GC-MS, Chemiluminescence and Spectrophotometry).

Water Analysis Methods: Classical, Spectrophotometry, Electrochemical methods and Ion chromatography.

Analytical methods for determining dissolved oxygen, BOD and COD.

Choice of methods for determining trace metals (As, Cd, Hg, Pb and Se).

Books Recommended

1. Environmental Chemistry; Nigel. J. Bunce; Wurez Publishers; 1991.
2. Environmental Chemistry; 2nd edn; Colin Baird; Freeman & Co; 1991.
3. A Textbook of Environmental Chemistry; O. D. Tyagi & M.Mehra; Anmol Publishers; 1990.
4. Environmental Chemistry; A. K. De; Wiley Eastern; 1995.
5. Environmental pollution Analysis; S. M. Khopkar; Wiley Eastern.
6. Environmental Chemistry; S. E. Manahan(6^{th} /7^{th} /8^{th} /9^{th} Edns); Lewis Publishers.
7. Environmental pollution; B.K.Sharma & H.Kaur; Goel Publishers;1996.

Course No. CH18105DCE

Title: Laboratory Course in Inorganic Chemistry (04 Credits)

Max. Marks: *100* ***Duration:*** *64 Contact hours*
Continuous Assessment: *20 marks* ***End Term Exam:*** *80 Marks*

I. Preparation of Coordination compounds of Transition metals:

1. Theoretical appraise of first row Transition metal Coordination Chemistry.
2. Synthesis as a Laboratory Technique (Concepts, Calculations and Design of Synthetic procedures).
3. Selected preparations of the following coordination compounds with the specific objectives:

i) Mercurytetrathiocyanatocobaltate(II)	:	To visualize the complexation process.
ii) Tristhioureacopper(I)sulphate monohydrate	:	Insitu generation and Stabilization of unusual oxidation state and re-crystallization /crystal growing
iii) Hexaamminecobalt(III) chloride	:	Multistep synthetic procedure
iv) Trisethylenediaminecobalt(III) chloride	:	Two stage synthesis and aerial oxidation/Resolution of a racemic mixture
v) Ammonium dodeca molbedophosphate	:	Synthesis of a heteroploy metallate/ Bonding and structure.

II. Paper Chromatography:

(i) Principle, Separation process, Technique of Paper Chromatography. Design of mobile phase.
(ii) Methods of paper chromatography (Ascending, Descending and Radial)
(iii) Comparative mobile phase study of separating mixtures. Chromatogram analysis and Interpretation.

III.

A. Qualitative Analysis by Semi micro Technique:

Discussion about the analysis scheme. Analytical groups and Group reagents. Scales of Analysis, Skill of semi micro technique. Chemistry involved in separation and identification of less familiar cations by semi micro analysis.

B. Identification of four less familiar cations from different analytical groups with simple and complex combinations:

(i) Group I and II A
(ii) Group I, II A and II B
(iii) Group IIA and II B
(iv) Group I and Group III
(v) Group II B and Group III
(vi) Group III only.

IV. Inorganic Quantitative Analyses:

A. **Gravimetry:**

i) Skill and importance of weighing in Chemistry, Gravimetreric Calculations

ii) Precipitation process in homogenous mixtures, Precipitating agents, conditions of precipitation.

iii) Precipitate processing(Digestion, Ignition); reducing precipitation errors(Co- and post precipitation)

B. **Tritimetry:**

i) Types and skill of titration, concept of Complexometric titrations, tritimeteric calculations.

ii) Metallochromic Indicators: selection, structure, and mechanism of action.

III) Role and selection of buffers in Complexometreric titrations, EDTA Back titrations.

Separation and estimation of following Binary metal ion systems using Gravimetry&Tritimetry simultaneously:

i) Silver (Ag^{+}) as AgCl and Nickel (Ni^{2+}) as $[NiEDTA]^{2-}$ complex.

ii) Barium (Ba^{2+}) as BaSO4 and Zinc as $[ZnEDTA]^{2-}$ complex.

iii) Barium (Ba^{2+}) as $BaSO_4$ and Nickel (Ni^{2+}) as $[NiEDTA]^{2-}$ complex.

iv) Nickel (Ni^{2+}) as Ni $(dmg)_2$ complex and Magnesium (Mg^{2+}) as $[Mg\ EDTA]^{2-}$ complex.

v) Copper (Cu^{2+}) as CuSCN and Magnesium (Mg^{2+}) as $[MgEDTA]^{2-}$ complex.

Books Recommended:

1. Advanced Inorganic Chemistry, 5th ed. / 6th ed., F.A. Cotton , G. Wilkinson ; Wiley 1998/1999
2. Coordination Chemistry - D. Banerjea ; Tata McGraw Hill, 1993.
3. Vogel's Textbook of Quantitative chemical Analysis; 5th edn; Jeffery, Bassett; (ELBS, 1989).
4. Quantitative Analysis; 6th edn; Day, Underwood (Printice Hall, 1993).
5. Analytical Chemistry, 6th Ed; D. Christian, Wiley.
6. Quantitative Analysis; 6th edn; Day, Underwood (Printice Hall, 1993).

Course No: CH18106DCE

Title: Symmetry and Group Theory (02 Credits)

Max. Marks: *50* ***Duration:*** *32 Contact hours*
Continuous Assessment: *10 marks* ***End Term Exam:*** *40 Marks*

Unit-I Molecular Symmetry (16 Contact hours)

Molecular Symmetry - Symmetry elements and operations: Identity, rotation axis, reflection plane, inversion centre, improper rotation axis. Combination of symmetry operations, Symmetry groups and group multiplication tables.

Symmetry Classification of molecules: Point groups. Schoenflies notation of point groups. Identification of point groups. Matrices and their combination, block factored matrices, Matrix representation of symmetry operations.

Unit-II Character Tables and Spectroscopy (16 contact hours)

The Great Orthoganality Theorm-elementary idea, consequences of the Great Orthogonolity Theorem. Reducible and Irreducible representations, Mullikan symbols for IRS. Character table-construction of character tables for C2v, C3v and C4v point groups.

Applications of group theory to IR and Raman spectroscopy, Symmetry of IR and Raman active normal vibrational modes of AB_2, AB_3, AB_4, AB_5, and AB_6 type molecules.

Applications of symmetry to Molecular Chirality and Polarity.

Books Recommended

1. Chemical Applications of Group Theory; 2nd edn.; F.A.Cotton; Wiley Eastern; 1994)
2. Molecular Symmetry and Group Theory; L. Carter; Wiley; 1998.
3. Symmetry and Spectroscopy of Molecules; K. Veera Reddy; New Age 1998.
4. Inorganic Chemistry, Principles of structure and reactivity; 4th Edition; James E. Huheey, Ellen A. Keiter and Richard L. Keiter. Pearson Education Inc.

Course No: CH18107DCE

Title: Infrared, Raman and Electronic Spectroscopy (02 Credits)

Max. Marks: *50* ***Duration:*** *32 Contact hours*
Continuous Assessment: *10 marks* ***End Term Exam:*** *40 Marks*

Unit-I **(a) Fundamentals of Spectroscopy** **(08 Contact hours)**

Interaction of light with matter, transition probability, transition moment integral, derivation of selection rules.

Intensity of spectral lines; Einstein's treatment of absorption and emission processes. Beer Lambert Law: Transmittance, Absorbance, Molar Integrated Intensity, Oscillator strength.

Natural spectral line width, broadening of spectral lines -Doppler and Collision effects.

(b)Electronic and Photoelectron Spectroscopy **(08 Contact hours)**

Electronic Spectroscopy: Vibronic transitions. Intensity of spectra—the Franck-Condon principle. Electronic spectra of organic molecules, chromophores, auxochrome, spectral shifts Different types of electronic transitions; nomenclature, symmetry labels of electronic states--spectra of formaldehyde, Symmetry selection rules, Term Symbol (Elementary Idea). Effects of solvent, electron withdrawing and electron donating groups, conjugation and extended conjugation on the position of spectral bands.

Photoelectron Spectroscopy: Basic principles- photoionization process; ionization energies; Koopman's theorem. Photoelectron spectra of simple molecules (N_2, O_2),

Unit-II **(a) Infrared Spectroscopy** **(08 Contact hours)**

Linear harmonic oscillator- classical and quantum treatment of vibrations, vibrational energies of

diatomic molecules, zero point energy, force constant and bond strength, anharmonicity, Morse potential energy levels. Fundamental bands, overtones and hot bands. Vibration- rotation spectra of diatomic molecules; P, Q and R branches;

Vibrations of polyatomic molecules: Normal vibrational modes, selection rules; combination and difference bands. Factors influencing the band positions and intensities. Group frequencies and finger print region.

(b)Raman Spectroscopy **(08 Contact hours)**

Classical and Quantum theories of Raman scattering, Molecular polarizability, rotational, vibrational, and vibrational-rotational Raman spectra. Selection rules; rule of mutual exclusion. Applications.

Books Recommended

1. Molecular Spectroscopy; 2nd edn; J L. McHale; CRC Press 2015.
2. Infrared and Raman Spectroscopy; Principles and Spectral Interpretation; 2nd edn.; P. Larkin; Elsevier; 2011.
3. Introduction of Spectroscopy; 4th edn.; D.L. Pavia, G. M. Lampman, G.S. Kriz, J.Vyvan; Cengage Learning, 2008.
4. Introductory Raman Spectroscopy; J. R. Ferraro, K. Nakamoto & C. W Brown; 2nd edn; Academic Press 2005.
5. Modern Spectroscopy; J.M.Hollas; Wiley; 2004..
6. Physical Methods for Chemists; R.S.Drago; 2nd edn; Saunders; 1992.
7. Fundamentals of Molecular Spectrsocopy; C.N.Banwell, E.M.Mc Cash; 4th edn; Tata McGrawHill; 1994.
8. Physical chemistry; P. W. Atkins; 6th edition; Oxford University Press; 1998.
9. Electronic Absorption Spectroscopy and related techniques; D N Sathyanarayna; UniversitiesPress.
10. Theory and Applications of Ultraviolet Spectroscopy; H.H.Jaffe, M.Orchin; Wiley; 1962.
11. Molecular Spectroscopy; 1st Edn; J.L. Mchale; Prentice Hall; 1999.
12. Structural Methods in Inorganic Chemistry; 2nd edn; E.A.V.Ebsworth, D.W.H.Rankin, S.Cradock; Blackwell; 1991.

Course No: CH18001GE

Title: Surfactants and their Applications (02 Credits)

Max. Marks: *50* ***Duration:*** *32 Contact hours*
Continuous Assessment: *10 marks* ***End Term Exam:*** *40 Marks*

Unit-I Self-Assembly of Surfactants (16 Contact hours)

***Surfactants and Micelles*:** Classification of Surfactants, Solubility of **Surfactants:** Kraft temperature and cloud point, Micellization of surfactants: critical micelle concentration (cmc), aggregation number, counterion binding, factors affecting cmc in aqueous media. Thermodynamics of micellization: pseudophase model and mass action models. Structure and shape of micelles: geometrical consideration of chain packing, variation of micellar size and shape with surfactant concentration.

b) Micellar Solubilization and Catalysis: Introduction, factors affecting micellar solubilization: nature of surfactant/solubilizate, effect of additive and temperature. Effect of solubilization on micellar structure, cloud point and cmc of surfactants. Solubilization of drugs into micelles and its importance in drug delivery systems and controlled release. Theoretical consideration of reactions in micellar media. Examples of micellar catalysis for hydrolysis, oxidation and reduction reactions

Unit-II Mixed Systems (16 Contact hours)

a) **Mixed Surfactant systems**: Mixed micelle formation, mixed monolayer formation, synergism, various models of mixed micelle formation(Clint, Rubingh, Motamurra, Blankschtein, and Rubing-Holland models) and mixed monolayer formation(Rosen's model). Importance and practical applications of mixed surfactant systems.

b) **Surfactant-Polymer Systems:** Effect of polymers on aggregation behavior of surfactants and the factors governing their interaction. Phase behavior of polymer-surfactant mixtures. Characterization of polymer- surfactant systems by various techniques like viscosity, light scattering, spectroscopic and conductance measurements. Applications of surfactant-polymers systems.

Books Recommended

1. Properties of Liquids and Solutions; J.N. Murell and E. H. Boucher; John Wiley & Sons Ltd; 1982.
2. Physical Chemistry; P.W. Atkins; ELBS; Oxford; 1994.
3. Principles of Colloid and Surface Chemistry; P.C. Heimenz; Marcel Dekker Inc; New York; 1986.
4. Surfactants and Interfacial Phenomena; M. J. Rosen; John Wiley & Sons; New York; 1989.
5. Colloid and Interface Chemistry; R. D. Vold and M. J. Vold; Addison-Wesley; 1982.
6. Surfaces, Interfaces and Colloid; D. Y. Meyer; VCH Publishers; Inc; 1991.
7. Surfactants and polymers in aqueous solution; Jonsson, Lindmann, Homberg and Kronberg; John Wiley and sons; 1998.
8. Advances in Colloid and Polymer Science; B.K.Paul & S.P.Moulik, Current Science,Vol.80,p 990-,2001; Vol.78,p 99,1998.
9. Critical Reviews in Food Science and Nutrition; John Flanagan & Harjinder Singh, ,Vol. 46, pp221-237, 2006.
10. Advanced Drug Delivery Reviews; M. J. Lawrence & G.D.Rees; Vol, 45, p 898, 2000.
11. Energy Fuels; T. N. Dantas, A.A.D, Netoetal; DOI:10.1021/ ef900952y; 2010.

Course No: CH18001OE
Title: Chemistry in Everyday Life (02 Credits)

Max. Marks: *50* ***Duration:*** *32 Contact hours*
Continuous Assessment: *10 marks* ***End Term Exam:*** *40 Marks*

Unit-I **(16 Contact hours)**

(a) Water- An Amazing Chemical Stuff

Molecular structure and its unique properties. Composition of natural water.
Hard and Soft water. Standards for drinking water. Major causes of water pollution. Methods of treatment of water for domestic purposes including Reverse Osmosis.

(b) Household Chemicals

Chemistry of Soaps, Detergents, Optical Brighteners and Bleaching agents, Shampoos, Conditioners , Dyes, Hair Curling and Permanents, Deodorants and Antiperspirants, Perfumes, Tooth Pastes and Sunscreen Lotions. Disinfectants and moth repellents.

Unit-II

(a) Polymers and Plastics **(16 Contact hours)**

Characteristics and Types of Polymers.
The big six of Polymer: Low Density Polyethylene (LDPE) , High Density Polyethylene (HDPE), Polypropylene PP), Polystyrene (PS), Polyvinyl Chloride (PVC) and Polyethylene - Tetra phthalate (PET or PETE)- their chemical characteristics and uses.

(b) Oil & Natural Gases

Composition & Chemical structures of Petroleum Products. Refining of Petroleum, Cracking & Catalytic Reforming. Octane & Cetane rating of fuels. Diesel engine fuel, Kerosene and Gasoline. Lead in Petrol: Its role, disadvantages & alternatives. LPG & CNG as fuel. Addition of mercaptanes to Natural gases for safety reasons.

Books Recommended

1. Principles of Modern Chemistry; 2nd edn; Oxtoby and Nachtrieb; Saunders College Publications; 1987.
2. Chemistry Fundamentals An Environmental Prospective; 2nd edn; Buell and Girad; Jones and Barlett; 2013.
3. www.chemistryincontext; (American Chemical Society)