

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPTT./CENTRE: **Department of Chemistry**

1. Subject Code: **CYN-004** Course Title: **General Chemistry-I**

2. Contact Hours: **L: 3 T: 0 P: 2**

3. Examination Duration (Hrs.): **Theory** **Practical**

4. Relative Weightage: **CWS** **PRS** **MTE** **ETE** **PRE**

5. Credits: 6. Semester: **Spring** 7. Subject Area: **BSC**

8. Pre-requisite: **Nil**

9. Objective: To provide a theoretical and experimental knowledge of basic/fundamental chemistry.

10. Details of Course:

S. No.	Contents	Contact Hours
1.	Quantum Mechanics: Introduction to quantum chemistry, particle in a box – implication of its concepts, H atom, radial and angular wave functions, and shapes of orbital (<i>s</i> , <i>p</i>).	4
2.	Thermodynamics: Statistical concept of entropy, description of equilibrium, feasibility of chemical reactions, Clausius-Clapeyron equation, partial molar quantities– chemical potential.	4
3.	Kinetics and Catalysis: Theories of chemical reactions – Draw-backs of collision theory, transition state theory using partition functions, thermodynamic formulation of transition state theory, homogeneous catalysis.	4
4.	Corrosion and Fuel cells: Electrochemical corrosion and fuel cells.	2
5.	Stereoisomerism: Stereochemistry of addition at carbon-carbon double bond, addition of bromine to cis-, and trans- butene, oxidation across the double bond through peroxides and permanganate, Diels Alder reaction [4+2] and [2+2] cycloaddition reactions.	5
6.	Synthesis of some important compounds such as benzocaine, saccharin, salbutamol and thyroxine. Introduction to spectroscopic techniques for structural prediction of organic compounds.	7
7.	Novel Polymers: Stereo chemical control of synthesis, Ziegler-Natta catalyst, polyurethanes, conducting polymers.	2
8.	Coordination Chemistry: Comparison of the stability of octahedral and tetrahedral complexes on the basis of crystal field stabilization energy, factors affecting the magnitude of Δ , applications of crystal field theory, variation of hydrated ionic radii and hydration enthalpy/stability of complexes, Jahn-	5

	Teller effect– definition and examples from d^9 system, static and dynamic Jahn-Teller effects.	
9.	Organometallic Chemistry: Factors affecting M-C bond formation, transition metal- π alkene complexes – synthesis, reactions, bonding and stability. Applications of organometallic compounds in catalytic processes such as hydroformylation, hydrogenation, catalytic decarbonylation, olefin metathesis and enantioselective hydrogenation of alkenes.	6
10.	Spectroscopic Techniques: Interaction of electromagnetic radiation with matter, spectroscopic techniques viz., UV-Vis and IR, and their applications for characterization of simple compounds.	3
	Total	42

List of Experiments:

i)	Determination of sodium carbonate in baking/washing soda.
ii)	Determination of Zn by EDTA- complexometric titration.
iii)	Solvent free synthesis -Wittig olefination of aldehyde or ketone by grinding.
iv)	Determination of viscosity of a polymer in a solution /or in a mixture of liquid.
v)	Determination of surface excess concentration of 1-butanol in aqueous solution.
vi)	Kinetics of a reaction between hydrogen peroxide and iodine in acidic medium.
vii)	Photochemical reduction of ferric oxalate in cyanotype blue printing.
viii)	Spectrophotometric determination of [Fe (III)] by using KSCN.
ix)	Identification of functional groups in an organic compound.
x)	Characterization of an organic/inorganic compound by UV-Vis and IR spectra.
xi)	Spectrophotometric determination of λ_{max} and concentration of $KMnO_4/K_2Cr_2O_7$.
xii)	pH metry/ potentiometry titration: strong acid – strong base.
xiii)	Preparation of potash alum from scrap aluminium.
xiv)	Synthesis of potassium trisoxalatochromate(III).
xv)	Synthesis of a polymer.

11. Suggested Books:

S. No.	Authors/ Title/ Publisher	Year of Publication
1.	Lee, J.D., “Concise Inorganic Chemistry”, 5 th Ed., Chapman & Hall.	2002
2.	Huheey, J.E., Keiter, E.A., Keiter, R.L. and Medhi, O.K. “Inorganic Chemistry: Principles of Structure and Reactivity”, 4 th Ed., Pearson Education Asia.	2009
3.	Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., “Organic Chemistry”, 7 th Ed., Pearson Education in South Asia.	2013
4.	Silbey, R.J. and Alberty, R.A., “Physical Chemistry”, 3 rd Ed, John Wiley & Sons, Inc.	2003
5.	Atkins, P.W., Physical Chemistry, 8 th Ed., Oxford University Press.	2006
6.	March, J., “Organic Chemistry: Reactions, Mechanisms and Structures”, 6 th Ed., John Wiley & Sons.	2007