

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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

1. Subject Code: **CYN-006** Course Title: **General Chemistry-II**

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 impart knowledge of general chemistry.

10. Details of Course:

S. No.	Contents	Contact Hours
1.	Molecular Reaction Dynamics: Collision theory of bimolecular reactions and its drawbacks, transition state theory and its thermodynamic formulation, comparison of collision theory and transition state theory.	4
2.	Catalysis: Homogeneous catalysis – kinetics of acid and base catalyzed reactions with suitable examples, heterogeneous catalysis – surface phenomenon, porosity, derivation of Langmuir adsorption isotherm, Langmuir-Hinshelwood mechanism.	5
3.	Photochemistry: Laws of photochemistry, photophysical and photochemical processes and their quantum efficiencies, Franck-Condon principle, photosensitizers and their application to solar cells.	5
4.	Polymerization: Synthesis of polymers, properties of polymers – degree of polymerization, molecular mass of polymers, tacticity and glass transition temperature. High temperature and conductive polymers, methods of modifying polymers, biopolymers.	6
5.	Energy Resources: Coal – calorific value, analysis, carbonization, petroleum – fractional distillation, gasoline/petrol – classification, knocking, octane number, natural gas.	3
6.	Organometallic Chemistry: Factors affecting M–C bond formation, general methods of formation of organometallic compounds, reactions of organometallic compounds, comparison of main group and transition metal organometallics, bonding in transition metal- π alkene complexes. Applications of organometallic compounds in catalytic processes such as hydroformylation, hydrogenation, Ziegler-Natta catalysis, catalytic decarbonylation and olefin metathesis.	6
7.	Volumetric and Gravimetric Determination of Metals and Non-metals: Redox titration– iodometric titration, acid-base titration, complexometric titrations, co- and post-precipitation, schematic description of methods for determination of Fe, Cu, Al, Zn, Ni, Pb, Sn, P and S.	5

8.	Spectroscopic Techniques: Interaction of electromagnetic radiation with matter, spectroscopic techniques viz., AAS, ICP, UV-Vis, IR and Mass spectroscopy, and their application to atomic and molecular systems.	8
	Total	42

List of Experiments:

i)	Determination of sodium carbonate in baking/washing soda.
ii)	Determination of Zn by EDTA– complexometric titration.
iii)	Determination of nitrogen as ammonia in a sample.
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)	Synthesis of a polymer.
x)	Characterization of an organic/inorganic compound by UV-Vis and IR spectra.
xi)	Spectrophotometric determination of λ_{max} and concentration of $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$.
xii)	pH metry/ potentiometry titration: strong acid – strong base.
xiii)	Preparation of potash alum from scrap aluminium.
xiv)	Synthesis of potassium trisoxalatochromate(III).
xv)	Determination of Cu by iodometric titration.

11. Suggested Books:

S. No.	Authors/ Title/ Publisher	Year of Publication
1.	Atkins, P.W., “Physical Chemistry”, 8 th Ed., Oxford University Press.	2006
2.	Turro, N.J., Ramamurthy, V. and Scaiano, J.C., “Modern Molecular Photochemistry of Organic Molecules”, University Science Books.	2008
3.	Skoog, D.A., Holler, F.J. and Crouch, S.R., "Principles of Instrumental Analysis", 6 th Ed., Thomson Brooks.	2006
4.	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
5.	Christian, G.D., “Analytical Chemistry”, 6 th Ed., John Wiley & Sons Inc.	2004
6.	Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., “Organic Chemistry”, 7 th Ed., Pearson Education in South Asia.	2013
7.	Mallick, A., “Engineering Chemistry”, Viva Books Pvt. Ltd.	2009