

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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

1. Subject Code: **CY-008** Course Title: **General Chemistry-III**

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 basic knowledge of chemistry.

10. Details of Course:

S. No.	Contents	Contact Hours
1.	Thermodynamics: Statistical concept of entropy, description of equilibrium and feasibility of chemical reactions, Clausius-Clapeyron equation, partial molar quantities-chemical potential, ionic activity coefficients.	4
2.	Kinetics: Theories of chemical reactions – Draw-backs of collision theory, transition state theory using partition functions and its thermodynamic formulation, consecutive and parallel reactions.	4
3.	Photochemistry: Basics of photochemistry, photochemical reactions in aqueous medium and environment, free radicals as reactive intermediates, their methods of preparation and use in synthesis, CFCs and alternatives to CFCs.	4
4.	Chemistry of Natural Water: Speciation of acids and bases, pC-pH diagrams and their applications, redox potentials – their uses in chemical speciations, acid-base and redox chemistry of compounds of sulphur, nitrogen and phosphorus including their environmental implications. Heavy metals (Pb, Hg and As) and their speciation causing toxicity.	7
5.	Corrosion: Corrosion processes in metals – electrochemical aspects, prevention strategies for corrosion.	2
6.	Cement Chemistry: Cement– its constituents and their structures, classification of cement, hydration process and importance of the products of hydration, chemistry of pozzolanic reactions. Analysis of Portland cement with reference to insoluble residue, total silica, sesquioxides, iron, lime and manganese. Role of calcium hydroxide in cement.	7
7.	Soil Chemistry: Chemical composition of soils, types of clay minerals, soil	5

	colloids, diffused double layers, sorption processes, cation and base exchange phenomenon in soils, isomorphous substitution.	
8.	Petroleum Chemistry: Overview of petroleum processing – fractional distillation, gasoline/petrol – classification, knocking, octane number.	3
9.	Spectral Techniques: Introduction of spectroscopic techniques viz., UV-Vis, IR, and Mass spectroscopy for structural prediction of organic compounds.	6
	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)	Identification of functional groups in an organic compound.
x)	Characterization of an organic/inorganic compound by UV-Vis and IR spectra.
xi)	Sectrophotometric 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).

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.	Manahan, S.E., “Environmental Chemistry”, 8 th Edition, CRC Press.	2005
4.	Masters, G.M. and Ela, W.P., “Introduction to Environmental Engineering and Science”, 3 rd Ed., Pearson Education.	2008
5.	Taylor, H.F.W., Cement Chemistry, 2 nd Ed. (reprinted), Thomas Telford Services Ltd., London.	2004
6.	Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., “Organic Chemistry”, 7 th Ed., Pearson Education in South Asia.	2013
7.	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

8.	Sposito, G., "Chemistry of Soils", 2 nd Ed., Oxford University Press.	2008
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