INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

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

1. Subject Code: **CYN-002** Course Title: **Organic and Inorganic Chemistry**

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

3. Examination Duration (Hrs): **Theory** **3** **Practical** **0**

4. Relative Weightage : **CWS** **15** **PRS** **25** **MTE** **20** **ETE** **40** **PRE** **0**

5. Credits: **4** 6. Semester: **Spring** 7.Subject Area: **BSC**

8. Pre-requisite: **Nil**
9. Objective: To impart basic knowledge of organic and inorganic chemistry.
10. Details of Course:

S. No.	Contents	Contact Hours
1.	**Heteroatoms in Organic Chemistry:** Introduction to heterocyclic chemistry, aromaticity, reactivity and synthesis of thiophene, pyridine, furan and pyrrole.	**6**
2.	**Stereochemistry and Reaction Mechanisms:** 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. Aromatic nucleophilic substitution mechanisms (S_NAr, S_N1 and arynes), reactivity and reactions.	**8**
3.	**Synthesis and Characterization** of some important compounds such as benzocaine, saccharin, salbutamol and thyroxine. Introduction to mass spectroscopy and NMR spectroscopy for structural prediction of organic compounds.	**9**
4.	**Novel Polymers:** Stereo chemical control of synthesis, molecular mass of polymers, polyurethanes, conducting polymers, doping, Shirakawa experiments, oxidation of aniline, biopolymers, and plastics.	**5**
5.	**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-Teller effect− definition and	**7**

	examples from d^9 and high-spin d^4 systems, static and dynamic Jahn-Teller effects.	
6.	**Organometallic Chemistry:** Factors affecting M-C bond formation, synthesis, reactions and structures including spectroscopic features of metal carbonyls, 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.	**7**
	Total	**42**

List of Experiments:

i)	Determination of sodium carbonate in baking/washing soda.
ii)	Determination of Zn by EDTA- complexometric titration.
iii)	Solvent less synthesis- Wittig reaction.
iv)	Determination of the equivalent weight of an organic acid.
v)	Identification of functional groups in an organic compound.
vi)	Characterization of an organic compound by UV-Vis and IR spectra.
vii)	Synthesis of a polymer.
viii)	Determination of λ_{max} and concentration of $KMnO_4/K_2Cr_2O_7$ spectrophotometrically.
ix)	Determination of ligand field strength of ligands.
x)	Synthesis of potassium trisoxalatochromate(III).
xi)	Preparation of p-nitroacetanilide and determination of melting point, and matching with known sample.
xii)	Synthesis of an azo dye and its application in textiles.
xiii)	Test of carbohydrate as osazone
xiv)	Determination of calcium in chalk/toothpaste.

11. Suggested Books:

S.N	Name of Authors/ Books/ publisher	Year of Publication
1	Morrison R. T. and Boyd R.N., " Organic Chemistry", 6th Ed., Prentice Hall of India.	**2001**
2	Clayden, J., Greeves, N., Warren, S., and Wothers, P., "Organic Chemistry" Oxford University Press	**2009**
3	Lee, J.D., "Concise Inorganic Chemistry", 5th Ed., Chapman & Hall.	**2010**
4	Huheey, J.E., Keiter, E.A., Keiter, R.L. and Medhi, O.K. "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Pearson Education	**2009**
5	March, J, Organic Chemistry: Reaction Mechanism and Structures, 6th Ed, John Wiley & Sons	**2007**