University of Calcutta under Graduate Curriculum under Choice Based Credit System (CBCS)
Lesson Plan with Syllabus for Chemistry (G) Semester-IV
Total Marks-100 (Credits: Theory-04, Practical-02)
(Theory: 50; Practical: 30; Internal Assessment: 10; Attendance: 10)
[Marks obtained in this course will be taken to calculate SGPA & CGPA]

Tentative may subject to change:					
Months	**Week**	**Unit**	**Topic**	**No. of Lectures** for Each Section	**Teacher**
February	3rd	1	***Alcohols, Phenols, and Ethers*** *Alcohols* ▪ *Preparation:* 1°-, 2°- and 3°- alcohols: using a Grignard reagent, reduction of aldehydes, ketones, carboxylic acid, and esters	2	TKL
		4	***Amines and Diazonium Salt*** ▪ Amines: strength of organic bases; Preparation: from alkyl halides, Hofmann degradation	1	SM
		6	***Crystal Field Theory (CFT)*** ▪ Postulates of Crystal field theory ▪ Crystal field splitting of Octahedral complex and effects for weak and strong field ligand	1	PKD
March	1st	1	***Alcohols, Phenols, and Ethers*** *Alcohols* ▪ *Reactions:* With sodium, oxidation (alkaline $KMnO_4$, acidic dichromate)	2	TKL
		4	***Amines and Diazonium Salt*** ▪ Reactions: with HNO_2 (distinction of 1°-, 2°- and 3°- amines), Schotten- Baumann reaction	1	SM
		6	***Crystal Field Theory (CFT)*** ▪ Crystal field splitting of Tetrahedral complex and factors affecting the magnitude of D ▪ Comparison of CFSE for Octahedral and Tetrahedral complexes, Spectrochemical series	1	PKD
March	2nd	1	***Alcohols, Phenols, and Ethers*** *Alcohols* ▪ *Diols:* Pinacol-pinacolone rearrangement (with mechanism) (*with symmetrical diols* only)	2	TKL
		4	***Amines and Diazonium Salt*** ▪ Diazo coupling reaction (with mechanism)	1	SM
		6	***Crystal Field Theory (CFT)*** ▪ Tetragonal distortion of Octahedral geometry, Jahn-Teller distortion, Square planar geometry	1	PKD
	3rd	1	***Alcohols, Phenols, and Ethers*** *Phenols* ▪ *Preparation:* cumene hydroperoxide method, from diazonium salts; acidic nature of phenols	2	TKL
		4	***Amines and Diazonium Salt*** ▪ Diazonium salts: Preparation: from aromatic amines; Reactions: conversion to benzene, phenol, benzoic acid, and nitrobenzene	1	SM
		7	***Quantum Chemistry and Spectroscopy*** • Basic Concept of Electromagnetic radiation and its interaction with matter	1	PKD
	4th	1	***Alcohols, Phenols, and Ethers*** *Phenols* • *Reactions:* electrophilic substitution: nitration and halogenations; Reimer-Tiemann reaction,	2	TKL

			Schotten Baumann reaction, Fries rearrangement, and Claisen rearrangement		
		4	***Amines and Diazonium Salt*** • Nitro compounds (aromatic): reduction under different conditions (acidic, neutral, and alkaline)	1	SM
		7	***Quantum Chemistry and Spectroscopy*** Wave-particle duality, the link between spectroscopy and quantum chemistry	1	TKL
	5th		****Student Lecture: On Crystal Field Theory (CFT)***	1	PKD, SM, TKL

Months	**Week**	**Unit**	**Topic**	**No. of Lectures** for Each Section	**Teacher**
April	1st	1	***Alcohols, Phenols, and Ethers*** *Ethers* ▪ *Preparation:* Williamson's ether synthesis; ▪ *Reaction*: cleavage of ethers with HI	2	TKL
		5	***Amino Acids and Carbohydrates*** *Amino Acids* ▪ *Preparations* (glycine and alanine only)*:* Strecker synthesis, Gabriel's phthalimide ▪	1	SM
		7	***Quantum Chemistry and Spectroscopy*** ▪ Spectroscopy and its importance in chemistry ▪ types of spectroscopy	1	PKD
	2nd	2	***Carbonyl Compounds*** *Aldehydes and Ketones* ▪ *Preparation:* from acid chlorides, nitriles, and Grignard reagents; general properties of aldehydes and ketones	2	TKL
		5	***Amino Acids and Carbohydrates*** *Amino Acids* ▪ Synthesis; general properties; zwitterion, isoelectric point	1	SM
		7	***Quantum Chemistry and Spectroscopy*** ▪ Difference between atomic and molecular spectra ▪ Postulates of quantum mechanics and quantum mechanical operator	1	PKD
			McQ based Assessment for all 3-section on Unit-1, 4 & 6	1	PKD, SM, TKL
	3rd	2	***Carbonyl Compounds*** *Aldehydes and Ketones* ▪ *Reactions:* with HCN, $NaHSO_3$, NH_2-G derivatives and with Tollens' and Fehling's reagents; iodoform test; aldol condensation (with mechanism)	2	TKL
		5	***Amino Acids and Carbohydrates*** *Carbohydrates* ▪ classification and general properties; glucose and fructose: constitution	1	SM

		7	***Quantum Chemistry and Spectroscopy*** ▪ Free particle, Particle in a 1-D box	1	PKD
	4th	2	***Carbonyl Compounds*** *Aldehydes and Ketones* ▪ Cannizzaro reaction (with mechanism), Wittig reaction, benzoin condensation; Clemmensen reduction, Wolff-Kishner reduction	2	TKL
		5	***Amino Acids and Carbohydrates*** *Carbohydrates* ▪ Osazone formation; oxidation-reduction reactions	1	SM
		7	***Quantum Chemistry and Spectroscopy*** • Normalization of wave functions and concept of zero-point energy • Rotational Motion: Schrodinger equation of a rigid rotator and its results	1	PKD
May	1st		******* Library work assignment***		PKD, TKL, SM
	2nd	3	***Carboxylic acid and their derivatives*** *Carboxylic acids* • Strength of organic acids: a comparative study with emphasis on factors affecting pK values • *Preparation:* acidic and alkaline hydrolysis of esters ($B_{Ac}2$ and $A_{AC}2$ mechanisms only) and from Grignard reagents	2	TKL
		5	***Amino Acids and Carbohydrates*** *Carbohydrates* ▪ Ascending (Kiliani-Fischer method) and descending (Ruff's method) in monosaccharides (aldoses only)	1	SM
		7	***Quantum Chemistry and Spectroscopy*** ▪ Quantization of rotational energy level ▪ Microwave spectra of diatomic molecules and selection rules	1	PKD
	3rd	3	***Carboxylic acid and their derivatives*** *Carboxylic acids derivatives* ▪ *Preparation:* acid chlorides, anhydrides, esters, and amides from acids ▪ *Reactions:* Interconversion among acid derivatives	2	TKL
		5	***Amino Acids and Carbohydrates*** ▪ Mutarotation	1	SM
		7	***Quantum Chemistry and Spectroscopy*** • Structural information derived from rotational spectroscopy	1	PKD
	4th	**3**	***Carboxylic acid and their derivatives*** *Carboxylic acids derivatives* ▪ *Reactions:* Claisen condensation	2	TKL
		7	***Quantum Chemistry and Spectroscopy*** ▪ Vibrational Motion: Schrodinger equation of a linear harmonic oscillator and its results	1	PKD

June	1st				
			*****Guest Lecture***		
	2nd	**3**	***Carboxylic acid and their derivatives*** ▪ *Reactions:* Perkin reaction ▪ Question answers discussion	2	TKL
		7	***Quantum Chemistry and Spectroscopy*** ▪ Quantization of vibrational energy levels, selection rules	1	PKD
			▪ Question answers discussion	1	SM
		Internal Assessment	**McQ based Internal Assessment for all sections**		PKD, SM, TKL

Tentative may subject to change: Practical Class			
Months	Weeks	Topic	Teacher
September	3rd	▪ Laboratory work discussion	TKL
	4th to 5th	• **Qualitative Analysis of Single Solid Organic Compound(s)** • Experiment A: Detection of special elements (N, Cl, and S) in organic compounds	
October	1st to 2nd	• Experiment B: Solubility and Classification (solvents: H_2O, dil. HCl, dil. NaOH)	
November	1st to 2nd	• Experiment C: Detection of functional groups: Aromatic -NO_2, Aromatic -NH_2, -COOH	
	3rd to 4th	• Experiment C: Carbonyl (no distinction of –CHO and >C=O needed), -OH (phenolic) in solid organic compounds	
December	1st to 2nd	• Experiments A - C with unknown (at least 6) solid samples containing not more than two of the above type of functional groups should be done	
	3rd to 4th	• Experiments A - C with unknown (at least 6) solid samples containing not more than two of the above type of functional groups should be done	
January	1st to 2nd	***Identification of a pure organic compound*** • *Solid compounds*: oxalic acid, tartaric acid, succinic acid, resorcinol, urea, glucose, benzoic acid and salicylic acid	
	3rd to 4th	• *Liquid Compounds*: methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene	