

KU5DSCCHE302: INORGANIC CHEMISTRY- III

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300	KU5DSCCHE302	4	75

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture/ Tutorial	Practical/ Internship	CE	ESE	Total	
3	2	35	65	100	1.5

Course Description: This major paper describes the concepts of gravimetric analysis, separation-chemistry, instrumental techniques in analytical chemistry and chromatography, acids, bases, non-aqueous solvents, introduction to gravimetric techniques and corrosion. Practical session deals with introduction to gravimetric techniques.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the qualitative and quantitative aspects of analysis and separation techniques and get practical knowledge in laboratory	U /A
2	Explain instrumentation and working principle of different analytical techniques –TGA, DTA and radio chemical method of analysis	R
3	To understand scientific principles of corrosion, theories of corrosion and factors affecting Corrosion	U
4	Understanding the properties, behaviour and applications of acids, bases and non-aqueous solvents	U

***Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)**

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2	3	2	3	1	0
CO 2	3	2	3	2	2	1	1
CO 3	3	3	3	2	2	1	0
CO 4	3	3	3	2	2	1	1

Course Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION		HOURS
1		PRINCIPLES OF GRAVIMETRIC ANALYSIS AND SEPARATION-CHEMISTRY		15
	1	Gravimetric analysis – unit operations in gravimetric analysis. Precipitation: Conditions of precipitation – co precipitation and post precipitation		
	2	Principle of gravimetric estimation of iron and nickel - Precipitation phenomena – precipitation trans homogenous solution		
	3	Organic precipitants in inorganic analysis (a detailed study) – extraction of metal ions – nature of extractants – distribution law – partition coefficients – types of extraction and applications		
	4	Chelometric titrations (a detailed study) – titration curves with EDTA – feasibility of EDTA titration – indicators for EDTA titration and its theory (a detailed study) – selective masking and demasking techniques – industrial application of masking		

INSTRUMENTAL TECHNIQUES IN ANALYTICAL CHEMISTRY AND CHROMATOGRAPHY		14
2	1	Thermo-gravimetric analysis – introduction – instrumentation – factors affecting TGA – application of TGA- Differential thermal analysis – introduction – instrumentation – principle of working – factors affecting DTA – application- Differential thermal analysis – introduction – instrumentation – principle of working – factors affecting DTA – application
	2	Radio chemical methods of analysis – introduction – activation analysis – a brief study- Neutron diffraction – theoretical aspects – thermal neutron – instrumentation – application
	3	Basic principle, Column chromatography – Adsorption column chromatography and Partition column chromatography- Ion exchange chromatography - Ion exchange resins
	4	Thin layer chromatography - preparation of chromatoplate - running a thin layer chromatogram - location of spots- Brief introduction on Gel chromatography and paper chromatography –HPLC
CORROSION AND CORROSION CONTROL		6
3	1	Introduction - Causes of corrosion, types and Theories of corrosion- (Direct chemical attack or dry corrosion- Electrochemical theory or wet corrosion-Peroxide theory, acid theory, oxide theory)
	2	Differential aeration or concentration cell corrosion- Factors influencing corrosion- nature of the metal- nature of the environment. Corrosion control
4.	ACIDS, BASES AND NON-AQUEOUS SOLVENTS	10
	1	A generalized acid base concept-Measure of acid base strengths – gas phase basicity – proton affinities – gas phase acidities – proton loss gas phase acidities
	2	Electron affinities – systematic of Lewis acid-base interaction – bond energies – steric effect – proton sponges-Solvation effects and acid base anomalies

	3	Hard and soft acids and bases – classification – strength and hardness and softness – symbiosis – theoretical basis of hardness and softness – electron negativity and hardness and softness	
	4	Classification of solvents – properties of non-aqueous solvents like NH_3 and H_2SO_4 – Chemistry of molten salts as non-aqueous solvent systems – solvent properties – room temperature molten salts –unreactive molten salts	
5	TEACHER SPECIFIC MODULE - INTRODUCTION TO GRAVIMETRIC TECHNIQUES AND ITS HIGHLIGHTS – PRACTICAL Minimum 6 experiments to be done.		30
	1.	Determination of water of hydration in crystalline barium Chloride.	
	2.	Determination of barium as barium sulphate.	
	3.	Determination of sulphate as barium sulphate.	
	4.	Determination of iron as ferric oxide.	
	Open ended Experiments (Suggestions)		
	5.	Determination of calcium as calcium carbonate.	
	6.	Estimation of nickel as nickel dimethylglyoxime.	
	7.	Determination of copper as cuprous thiocyanate.	
	8.	Determination of magnesium as magnesium oxinate.	

Essential Readings:

1. B R Puri, L R Sharma, K C Kalia, Principles of Inorganic Chemistry, Milestone publishers, New Delhi.
2. D A Skoog, D M West and S R Crouch, Fundamentals of Analytical Chemistry, 8th Edition, Brooks/Cole Nelson (Chapter 12-17).
3. Vogel's Textbook of Quantitative Chemical Analysis
4. G D Christian, Analytical Chemistry, John Wiley and Sons.
5. J.D Lee, Concise inorganic chemistry, Blackwell Science, London
6. Jain & Jain, Engineering Chemistry, Dhanpat Rai Publishing Company.
7. Chatwal and Anand, Instrumental methods of chemical analysis.
8. A K Srivastava, P C Jain, Instrumental approach to chemical analysis. S Chand.
9. H Kaur, Instrumental methods of chemical analysis, PragatiPrakashan, Meer

10. Emelus and Anderson, Principles of Inorganic Chemistry.
11. R P Budhiraja, Separation Chemistry, Second edition, New age international publishers
12. Dr.S.K.Agarwala and Dr.Keemtilal, Advanced Inorganic Chemistry.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation (ESE)		65 (50T+15P)
Continuous Evaluation (CCA)		35 (25T+10P)
Theory		25
a)	Test Paper*	10
b)	Assignment	5
c)	Viva-Voce	5
d)	Seminar	5
Practical		10
a)	Skill	4
b)	Record	4
c)	Punctuality	2
Total		100

*Average mark of the best two written tests may be considered for internal mark.