

SEMESTER III

KU3DSCCHE201: INORGANIC CHEMISTRY- I

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200	KU3DSCCHE201	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: The course comprises modules on nuclear chemistry, Theoretical basis of analysis, Bonding in coordination compounds, Representative elements and Noble gases. Practical session deals with the qualitative analysis of anions and preparation of inorganic complexes.

Course Prerequisite: Knowledge in first, second semester chemistry topics.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Comprehensive understanding about nuclear reactions to distinguish the constructive and destructive applications and use them wisely	A
2	Understand statistical treatment of analytical data and the principles underlying qualitative mixture analysis to apply them in practical scenario.	A
3	A comprehensive understanding of periodicity in properties of s and p block elements and their compounds.	U

4	Able to analyse the various theories of bonding in coordination compounds and predict the geometry and properties of complexes.	An
5	Acquire skill in identifying the anions in a salt mixture, understand the way to eliminate an interfering acid radical	A
6	Acquire skill in preparing alums and its application in water purification.	A

***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	0	0	0	0	0	0
CO 2	0	3	0	0	0	0	1
CO 3	0	0	3	0	0	0	0
CO 4	0	1	0	3	0	0	1
CO 5	0	0	0	0	3	1	0
CO 6	0	0	0	0	1	3	2

Course Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION		HOURS
1		NUCLEAR CHEMISTRY		10
	1	Radioactivity - rate of radioactive disintegration – half life - Nature of radiation from radioactive elements. Artificial radio activity - Artificial transmutations of elements – cyclotrons		
	2	Stability of nucleus-binding energy-mass defect-packing fractions-n/p ratio- Detection and measurement of radioactivity - Radioactive tracers - Rock dating, Carbon dating		
	3	Induced radio activity - Q values of nuclear reactions - nuclear reactors nuclear fission and nuclear fusion		
	4	Classification of reactors - Breeder reactor - India's nuclear energy programme – BARC Nuclear energy programmes of India.		
2		THEORETICAL BASIS OF ANALYSIS – II		6
	1	Statistical treatment of analytical data-Average deviation from the mean - Standard Deviation – Relative standard deviation.		
	2	Reporting of analytical data- Statistical treatment of analytical data – Population and samples – Confidence limit- Test of significance – Student t-test, f-test, Q-test for rejecting data.		
	3	Applications of solubility product and common ion effect in the precipitation of cations – Interfering acid radicals and their elimination (oxalate, fluoride, borate, phosphate, chromate, arsenite and arsenate).		

3	CHEMISTRY OF REPRESENTATIVE ELEMENTS AND NOBLE GASES		19
	1	Hydrogen: Isotopes (separation method not needed)-Ortho and para hydrogen-Hydrides and their classification.	
	2	Alkali and alkaline earth metals: Periodic properties of, oxides, halides, hydroxides and carbonates (preparation not needed)	
	3	p block elements: Comparative study based on electronic configuration - Periodic properties of oxides and oxoacids of Nitrogen, Phosphorus and Chlorine (preparation not needed)-Acid-base properties of oxides- Inert pair effect-Metallic and non-metallic character of p-block elements.	
	4	Noble gases: Discovery of noble gases. Electronic configuration and position in the periodic table. General physical properties, uses of noble gases. Compounds of noble gases– Clathrates, compounds of Xenon—XeF ₂ , XeF ₄ , XeF ₆ , XeO ₂ F ₂ , XeOF ₂ , XeOF ₄ and XeO ₃ -Hybridization and geometry of these compounds	
4	BONDING IN COORDINATION COMPOUNDS- I		10
	1	Theories of bonding in transition metal complexes–Werner’s theory-Valence bond theory-Application to some complexes-Hybridization in tetrahedral, square planar and octahedral complexes – explanation of magnetic properties based on VBT. Limitations of VBT.	
	2	Crystal field theory-Crystal field splitting in octahedral, tetrahedral and square planar geometries. Factors affecting the magnitude of crystal field splitting- Spectrochemical series - Crystal field stabilization energy (CFSE). Explanation of colour, spectral and magnetic properties.	

5	TEACHER SPECIFIC MODULE- PRACTICAL INORGANIC QUALITATIVE ANALYSIS- I AND PREPARATION OF INORGANIC COMPOUNDS		30
	<i>Directions: Minimum 6 mixtures to be done. Familiarise virtual lab experiments related to the modules (minimum one). Any application like (b,c)those given in open ended section to be familiarised.</i>		
	1.	Systematic analysis of anions by semimicro method. Study of the reactions of the following anions with a view to the identification, confirmation and procedure for elimination - carbonate, acetate, oxalate, fluoride, chloride, bromide, iodide, nitrate, sulphate, borate, phosphate, chromate, arsenate, arsenite. One of the anions should be eliminating radical.	
	Open ended (suggestions)		
	2.	a) Virtual lab for nuclear fission and fusion etc. b) Preparation of alums (maximum two) and its application in water purification. c)Use of bleaching powder in disinfecting water d)Use of lime in adjusting pH of soil for agriculture	

Essential Readings:

1. H J Arinikar, Essentials of Nuclear Chemistry, 4th edition, New Age International, New Delhi, 1995.
2. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, Milestone Publishers and Distributors, 2008.
3. G D Christian, Analytical Chemistry, John Wiley and Sons
4. DA Skoog, DM West, Analytical Chemistry, An Introduction, 9th Edn., Mary Frinch.
5. J D Lee, Concise Inorganic Chemistry, 5th edition, Oxford University Press, New Delhi 2008.
6. Shriver and Atkins, Inorganic Chemistry, W. H Freeman and Company, 2006

7. J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson.
8. Dr.Wahid.U. Malik, Dr. G.D. tuli, Dr. R.D. Madan, Selected Topics in Inorganic Chemistry, S. Chand Publications
9. G. Svehla and B Sivasankar, Vogel's Qualitative Analysis, 7th Edn., Pearson, 2012.

Suggested Readings:

1. P L Soni and Mohan Katyal, Textbook of inorganic Chemistry, S. Chand and Sons, 20th rev. edn.
2. J.B. Rajam Atomic Physics, S. Chand and Co. Pvt.Ltd, 1974.
3. P L Soni and Mohan Katyal, Textbook of inorganic Chemistry, S. Chand and Sons, 20th rev. edn.

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.

Employability for the Course: The course enhances employability of the students by equipping them with essential knowledge and practical skills in chemistry