University of Kerala

Discipline	CHEMISTRY				
Course Code	**UK2DSCCHE102**				
Course Title	**ESSENTIALS OF INORGANIC CHEMISTRY**				
Type of Course	**DSC**				
Semester	2				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	1. Higher secondary level science knowledge 2. First semester DSC (Chemistry) offered by UoK (preferable)				
Course Summary	This course delves into metallurgy, crystalline state, radioactivity, nuclear chemistry, chemical cycles, group properties, and qualitative inorganic analysis. Students gain theoretical knowledge and practical skills necessary for understanding and analyzing inorganic materials and processes.				

Detailed Syllabus:

Module	Unit	Content	Hrs
	ESSENTIALS OF INORGANIC CHEMISTRY		**75**
I	**METALLURGY**		**9**
	1	Occurrence of metals, General principles of extraction of metals from their ores: Concentration of ores- roasting, calcinations and smelting	3
	2	General methods of extracting metal from concentrated ore Electrometallurgy and Pyrometallurgy; Refining of metals: electrolytic and zone refining only.	3
	3	Metallurgy of Titanium, Iron and thorium	3
II	**CRYSTALLINE STATE**		**9**
	4	Isotropy and anisotropy – symmetry elements in crystals – seven crystal systems	2
	5	Miller indices, Bravais lattices, primitive, bcc and fcc lattices of cubic crystals	2
	6	Bragg equation - diffraction of X rays by crystals – single crystal and powder method, detailed study of structure of NaCl and KCl crystals	3
	7	Liquid crystals, application and examples	2
III	**RADIOACTIVITY**		**9**

	8	Nuclear Chemistry – stability of Nucleus – n/p ratio, artificial transmutation and radio activity, mass defect, binding energy, atomic fission and fusion.	2
	9	Radioactive equilibrium (qualitative idea only)	1
	10	Detection of radio activity by Wilson's cloud chamber and Geiger Muller and Scintillation counter – Units of radio activity – Curie and Rutherford	2
	11	Nuclear fission and fusion reactions, Radio Carbon dating, Rock dating, Neutron activation analysis. Applications in agriculture and medicine. A brief study of the biological effects of radiation such as pathological and genetic damage	2
	12	Dosimetry – Units – Rad, Gray, Roentgen. Ferrous and Ceric sulphate dosimeters	2
IV	**CHEMICAL CYCLES, GROUP PROPERTIES, ACIDS, BASES AND BUFFERS**		**18**
	13	Carbon, Sulphur, Nitrogen, Phosphorous and hydrologic cycle	4
	14	Group properties (reactions) of anions in common minerals - Carbonate, Sulphate, Phosphate, Sulphides and Fluorides	3
	15	Classification of oxides – Acidic, Basic, Amphoteric and neutral	2
	16	Concepts of Acids and Bases, ionization of weak electrolytes.	3
	17	Influence of solvent on acid strength – levelling effect	2
	18	pH and its applications. Buffer solutions**.**	2
	19	Henderson equation	2
V	**PRACTICALS: INORGANIC QUALITATIVE ANALYSIS**		**30**
	20	**I. REACTIONS OF THE FOLLOWING CATIONS:** Hg^{+}, Pb^{2+}, Ag^{+}, Hg^{2+}, Bi^{3+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Mn^{2+}, Zn^{2+}, Ni^{2+}, Cd^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+} and NH_4^{+}. **II. SYSTEMATIC ANALYSIS OF TWO CATIONS IN A MIXTURE** The cations must be provided in solutions. A student must analyze **at least 5 mixtures** containing two cations each.	15
	21	**OPEN ENDED PRACTICALS: (Any 3 experiments are to be conducted - May be selected from the list or the teacher can add related experiments)** **III. GRAVIMETRIC ANALYSIS** a. Estimation of water of hydration in barium chloride crystals. b. Estimation of barium in barium chloride solution. **IV. DETERMINATION PHYSICAL CONSTANTS** c. Determination of boiling points of common solvents (b.pt range 100°C - 130°C d. Determination of melting points of organic substances (m.pt range 100°C - 130°C)	15

References

1. B. R Puri, L. R. Sharma K. C. Kalia, *Principles of Inorganic Chemistry*, Sobhanlal Nagin Chand & Co. New Delhi
2. J. D. Lee, *Concise Inorganic Chemistry*, ELBS
3. D. A Skoog, D M West, F J, Holler, S R Crouch, *Fundamentals of Analytical Chemistry*, 8th Edn., Brookes/Cole, Thomson Learning, Inc, USA, 2004
4. Puri, Sharma and Pathania, *Principles of Physical Chemistry*
5. Gurudeep Raj, *Advanced physical chemistry.*
6. Vogel's Text book of *Qualitative Analysis.*
7. J V. V. Ramanujam, "*Semi micro–Qualitative Analysis*"
8. E. S. Gilreath "*Qualitative Analysis using semi micro method*" Mc Graw Hill.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Discuss metallurgy and metallurgical processes and identify the extraction of different metals in daily life	An, E	PSO-2
CO-2	Get an insight on crystal structure and liquid crystals, draw and make crystal models of NaCl & KCl crystals	Ap, An	PSO-1
CO3	Evaluate the principles and applications of nuclear chemistry and radioactivity to analyze nuclear reactions, decay processes, their applications in different fields and adverse effects.	An, C	PSO-1
CO 4	Predict the chemical behavior of carbon, sulfur, nitrogen, phosphorus, and their roles in natural cycles, classify oxides and anions based on their chemical properties, evaluate the influence of solvents on acid strength, apply the concepts of pH, buffer solutions, and the Henderson equation to solve real-world chemical problems.	Ap, An	PSO- 1&5
CO 5	Apply the basic principles in qualitative analysis and identify cation and anion, identify the principles in	Ap, An	PSO-1&4

	analytical chemistry for identifying the cations in different salts.		

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: ESSENTIALS OF INORGANIC CHEMISTRY

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	CO-1	PO-1 PSO-2	An, E	C	L	
2	CO-2	PO-2 PSO-1	Ap, An	M	L	
3	CO3	PO-2 PSO-1	An, C	C	L	
4	CO 4	PO-3 PSO- 1&5	Ap, An	P	L	
5	CO 5	PO-1 PSO-4	Ap, An	F	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	-	2	-	-	-	2	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	3	-	-	-	-	-	-
CO 3	2	-	-	-	-	-	2	-	-	-	-	-	-
CO 4	2	-	-	-	2	-	-	2	-	-	-	-	-
CO 5	-	-	-	2	-	2	-	-	-	-	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	√	√		√
CO 2	√	√		√
CO 3	√	√		√
CO 4	√	√		√
CO 5	√	√		√