Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-4 (B.Sc)

Subject: Elementary Chemistry – BSCCM14312

Type of course: Major

Prerequisite: Students should have a basic understanding of fundamental scientific concepts and familiarity with general science principles of elements.

Rationale: This course provides foundational knowledge of chemical principles, enabling students to understand the composition, structure, and behavior of matter. It serves as a basis for advanced studies in science, engineering, and related fields, while also fostering analytical and problem-solving skills.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				SEE		CCE			
CI	T	P	C	Theory	Practical	MSE	LWA/V	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

Course Content:

Unit No	Course content	Hrs	% Weightage
1	**s and p -Block Elements:** General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens, uses. Group 13 Elements: Boron - physical and chemical	15	25%

	properties. Group 14 Elements: Carbon- Physical and chemical Properties.		
2	**Metal carbonyl Compounds:** Classification of metal carbonyls, General methods for preparation of metal carbonyls, Explanation of bonding in metal carbonyls, Effective atomic number rule(EAN) in metal carbonyls, Explanation for structure of metal carbonyls of Molybdenum(Mo), Tungsten(W), Iron(Fe), Manganese(Mn),Cobalt(Co),Nickel(Ni), Ruthenium(Ru) with their I.R spectra.	10	25%
3	**Coordination Compounds** Explanation of complex compound, The concepts of primary and secondary valences, Werner's theory (1893).Stability of complex compounds, Sidgwick' Powel co-ordinate bond theory of complex compounds.Drawbacks of Sidgwick Powel theory, Stereoisomerism such as geometrical and optical isomerism of ML4 and ML6 types of complex compounds.	10	25%
4	**Lanthanides and Actinides series:** Different nomenclature, symbol, atomic number, electronic configuration, Lanthanide series elements, their position in periodic table. Different methods for lanthanides elements separation. Effect of electronic, configuration on physical and chemical properties, lanthanide contraction and its post effect and their properties. General outlines for actinide.	10	25%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Periodic Table Scavenger Hunt** Students work in pairs or small groups to find elements that meet specific criteria, (e.g., find an element that forms +2 cations, find an element with a specific atomic radius, or locate transition metals) and make a report on the same and Upload it to GMIU web Portal.	10
2	**Label the Coordination Complex** Provide students with diagrams of different coordination complexes, and they label the metal center, ligands, coordination number, and oxidation state and Upload it to GMIU web portal.	10

3	**Werner's Theory Case Study** Students are given a case study involving a coordination compound. They will apply Werner's theory to predict the coordination number and geometry of the complex, identifying both primary and secondary valences. They will write a brief explanation of how Werner's theory explains the observed structure and stability and will upload the same on GMIU web Portal.	10
4	**Group Research and Presentation on Separation Methods** Each Student researching a different method of separating lanthanides (e.g., ion-exchange, solvent extraction, etc.). They will create a project with written report and a short presentation explaining the method, its efficiency, and the challenges involved. Students only need to upload report on GMIU web Portal.	10
5	**Attendance**	10
Total		50

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks **(Revised Bloom's Taxonomy)**						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	35%	35%	30%	00	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand the electronic configurations, physical and chemical properties, trends, and uses of s- and p-block elements.
CO2	Classify, prepare and learn bonding mechanisms.
CO3	Gain insights into stereoisomerism (geometrical and optical) in ML4 and ML6 complexes.
CO4	Summarize the concept of lanthanide contraction and its post-effects, and general characteristics of the actinide series.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1	To analyze quantitatively inorganic mixture containing 4 radicals Positive radicals: (Minimum 12 Mixture) (Without phosphate, arsenite, arsenate, borate, chromate and dichromate radicals) Pb^{2+}, Cu^{2+}, Sb^{2+}, Cd^{2+}, Bi^{3+},Sn^{2+}, Al^{3+}, Cr^{3+},Fe^{3+}, Fe^{2+}, Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+}, Ca^{2+}, Ba^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} and NH_4^{+} Negative radicals : Cl^{1-}, Br^{1-}, I^{1-}, NO_2^{1-}, NO_3^{1-}, CO_3^{2-}, S^{2-}, SO_3^{2-} and SO_4^{2-}	ALL	30
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Basic Inorganic chemistry,-F.A.Cotton, G.Wilkinson; John Wiley & Sons

[2] Modern Inorganic chemistry,-G.D.Parkes; Longmans, Green & Co. London.

[3] Modern Inorganic Chemistry, - R.D.Madan; S.Chand & Company Ltd.

[4] Vogel qualitative Inorganic Analysis by G. Svehla.:universities press.

[5] Quantum chemistry.- Iran.N.Levine ; P H I Learning Private Ltd.