Course Specification
(Bachelor)

Course Title:	**Principles of Inorganic Chemistry**
Course Code:	**CHM 1110**
Program:	**Bachelor of Science in Chemical Laboratories**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammad ibn Saud Islamic University (IMSIU)**
Version:	2024-**1**
Last Revision Date:	**15 September 2024**

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A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (2 Lectures, 3 Lab, 0 Tutorials)					
3 (2 Lectures, 3 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 2/year 1)					
4. Course General Description:					
In this module, students will study the elements of the periodic table in their different groups, alkali metals, halogens, s and p-block, inert gases, and the relation of properties with the position in the periodic table. This module's experimental part deals with identifying some anions and cations. Topics covered in the course also include Coordination Compounds and their magnetic properties, theories regarding complex geometries with their electronic configuration, types of ligands, and properties. The course will provide the students with Basic information about transition metals, including preparation methods and uses of elements and compounds.					
5. Pre-requirements for this course (if any):					
General Chemistry, CHM 1101					
6. Pre-requirements for this course (if any):					
None					
7. Course Main Objective(s):					
The main objective of this course is to provide a comprehensive understanding of the chemistry of both main groups and transition elements. This includes exploring general trends, specific properties, and significant compounds of the elements, as well as the structures, isomers, and nomenclature of coordination compounds. The course also emphasizes groundbreaking developments and industrial importance, highlighting these elements' unique characteristics and reactivity patterns.					

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning	0	0
3	Hybrid • Traditional classroom • E-learning	0	0
4	Distance learning	0	0

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**45**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)……**	**0**
	Total	75

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	To Outline general trends and specific chemistry of main-group elements, including their significant compounds.	K1, K4	▪ Five hours weekly, containing lectures and laboratory activities. ▪ A Private study, including a Homework	Direct: ✓exams, ✓Homework Laboratory Reports ✓Participation
1.2	To Describe the structures, isomers, and nomenclature of coordination compounds.	K1, K4	▪ Two hours of weekly lecture activities. ▪ Self-study	Direct: ✓exams, quizzes ✓Oral Discussion ✓Homework ✓Participation
1.3	To Recognize transition elements' properties, electronic configurations, and industrial significance from scandium to zinc.	K1, K3	▪ Five hours weekly containing lectures and laboratory activities. ▪ Think, talk, and list the industrial significance of inorganic compounds	Direct: ✓exams, quizzes ✓Laboratory Reports ✓Oral Discussion
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	To Analyze and predict trends in main-group elements' physical and chemical properties and their compounds.	S1,S3	• Introduce some solved and unsolved examples of main-group elements' physical and chemical properties to discuss and predict their properties • Brainstorming Exercises	Direct ✓ Questions in Lectures. ✓ Short Quizzes and Exams. ✓ Participation ✓ Homework
2.2	To Differentiate and name coordination compounds and determine their structural and isomeric forms.	S2, S3	Group Discussions and Laboratory Experiments	Direct ✓ Questions in Lectures. ✓ Short Quizzes and Exams. ✓ Participation ✓ Laboratory reports
2.3	To Evaluate the reactivity, electronic configurations, and practical applications of transition elements in industrial contexts.	S1, S2	• Lectures, laboratory activities, and Oral Discussions. • Brainstorming Exercises	Direct ✓ Questions in Lectures. ✓ Short Quizzes ✓ Participation ✓ Laboratory reports
2.4	To Diagram and illustrate experimentally obtained data during laboratory classes and field tasks, demonstrating oral and network communication and technical writing skills.	S1, S2, S4	• Lectures, laboratory activities, and Oral Discussions. • Brainstorming Exercises	Direct ✓ Homework ✓ Mini project ✓ Participation ✓ Laboratory reports

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	To appraise teamwork and create awareness to maintain scientific integrity during different assessments, projects, and mini-projects.	V2	• Group discussion, assignments, and homework • Lab-reports • Virtual labs and demonstrations	Direct ✓Oral tests, ✓lab performance, ✓Lab-reports, ✓Sheets Marks ✓Assignments and homework marks ✓Mini projects
3.2	To show personal values and attributes such as honesty, empathy and respect for others	V1, V2	• Teamwork and class discussions.	Direct ✓ lab reports ✓ Mini projects

C. Course Content:

No	List of Topics	Contact Hours
1.	**Chemistry of the Main Group Elements:** This chapter provides an overview of general trends in main-group chemistry, including physical properties, electronegativity, ionization energy, and chemical properties. The chapter then delves into the specific chemistry of hydrogen, followed by a detailed examination of groups 1, 2, 13, 14, 15, 16, 17, and 18. This includes a discussion of the alkali metals, alkaline earth metals, and the elements of groups 13 through 18, highlighting their unique properties and significant compounds. Additionally, the chapter explores groundbreaking developments in the chemistry of these elements, such as the discovery of new allotropes and unexpected reactivity patterns, providing a comprehensive understanding of main group chemistry.	10
2.	**Coordination Chemistry: Structure and Isomers:** This chapter provides an overview of the structures and isomers of coordination compounds. It begins with a historical overview,	8

	highlighting the contributions of Alfred Werner to the field. The chapter then delves into the nomenclature of coordination compounds, providing systematic methods for naming these complexes. A significant portion is dedicated to the various types of isomerism found in coordination compounds, including stereoisomers, such as cis-trans and chiral isomers, and constitutional isomers, like linkage and coordination isomers. The chapter concludes with a discussion on coordination numbers and the corresponding structures, from common coordination numbers like four and six to less common ones, emphasizing the diversity and complexity of coordination compounds.	
3.	**Transition elements:** This chapter provides an overview of the transition elements, specifically from scandium to zinc in Period 4. It discusses their physical properties, noting that these elements have higher densities, hardness, and melting points compared to main-group metals. The chapter explains the electronic configurations of these elements and highlights the concept of variable oxidation states, which are characteristic of transition elements. It covers their chemical reactivity, including the formation of complex ions, and how physical properties like color and magnetism arise from their electronic structures. The chapter also examines the industrial importance of these elements due to their resistance to oxidation and corrosion.	**12**
Total		**30**
Lab 01	**Safety and Laboratory equipment and measurements and how to make a report**	**3**
Lab 02	**Qualitative Analysis of HCl Group (CO_3^{-2}, HCO_3^-, S^{-2}, $S_2O_3^{-2}$, NO_2^- and SO_3^{-2})**	**3**
Lab 03	**Qualitative Analysis of H2SO4 Group (Cl^-, Br^-, I^- and NO_3^-)**	**3**
Lab 04	**Qualitative Analysis of Miscellaneous Group (SO_4^{-2}, $B_4O_7^{-2}$ and PO_4^{-3})**	**3**
Lab 05	**General scheme of acidic radicals**	**3**
Lab 06	**Qualitative Analysis of first group of cations**	**3**
Lab 07	**Qualitative Analysis of Second group of cations**	**3**
Lab 08	**Qualitative Analysis of Third group of cations**	**3**
Lab 09	**Qualitative Analysis of the Fourth group of cations**	**3**

Lab 10	Qualitative Analysis of Fifth group of cations	3
Lab 11	Qualitative Analysis of Six group of cations	3
Lab 12	General scheme of basic radicals	3
Lab 13	Preparation of hexammine nickel(II) chloride complex	3
Lab 14	Preparation of nitritopentaamminecobalt (III) Chloride complex	3
Lab 15	Revision and Lab.reports overview	3
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	Week 6th -7th	10 %
2.	Midterm 2	Week 11th -12th	10 %
3.	Quizzes, homework, class participation	During semester	10 %
4.	Laboratory	During semester	30 %
5.	Final examination	Week 16th	40 %
6.	Total		100%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	▪ Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2014). **Inorganic Chemistry** (5th ed.). Pearson Education. ISBN-13: 978-0-321-81105-9. ▪ **Vogel's Qualitative Inorganic Analysis**. 7th ed., Addison Wesley Longman Ltd, 1996.
Supportive References	• Chambers, C., & Holliday, A. K. (1975). **Modern Inorganic Chemistry: An Intermediate Text**. Butterworths. • Greenwood, N. N., & Earnshaw, A. (1997). **Chemistry of the Elements** (2nd ed.). Butterworth-Heinemann. • Henderson, W. (2000). **Main Group Chemistry**. The Royal Society of Chemistry.

Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Each classroom should have a whiteboard and a projector, with a maximum of 20 students.** • **In each laboratory, a list of safety and precautions is provided.** • **In each lab has proper ventilation and is well-equipped with instruments.** • **In each lab, there are containers for solid waste, liquid waste, and crushed glasses.** • **Each lab has a small pharmacy for first aid in case of an accident** • **In each lab, the rules, conditions, and safety mechanism, as well as a list of Risk and safety precautions according to Merck Catalogue, are hanging in the labs**
Technology equipment (projector, smart board, software)	• **The rooms have data show, Smart Board, and WI-FI access.**
Other equipment (depending on the nature of the specialty)	• **Appropriate Glassware for carrying the requested experiments (conical flasks, beakers, measuring cylinders)** • **Appropriate fine chemicals and solvents (distilled Water ammonium nitrate), Analytical balance (3 digits), Set gas laws with the glass jacket Data acquisition set for gas laws with glass jacket, PC, Windows® 95 or higher, calorimeter, thermometer, Filter papers, clamps, stands.**

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	• **Direct:** Questionnaire.
	Course Responsible	• **Direct:** Course e-Portfolio. • **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	• **Direct:** Questionnaire.

Assessment Areas/Issues	Assessor	Assessment Methods
		• Indirect: External assessor report.
Effectiveness of Students assessment	**Program Leaders**	• **Direct:** Course e-Portfolio.
Quality of learning resources	**Students**	• **Indirect:** Second examiner checklist- Course report.
	Faculty (Academic Advisory)	• **Direct:** course Entrance/Exit. • **Indirect:** Observations - Accreditation review.
	Program Leaders	• **Direct:** Course e-Portfolio. • **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	**Course Responsible**	• **Direct:** Exams - Course e-Portfolio. • **Indirect:** Second examiner checklist- Course report.
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**3 (NO. 1/3)**
DATE	**5/3/1446- 8/09/2024**