Course Specification
(Bachelor)

Course Title:	**Industrial Inorganic Chemistry**
Course Code:	**CHM 1314**
Program:	**Bachelor of Science in Chemical Laboratories**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	2024-**1**
Last Revision Date:	**15 September 2024**

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 3 (2, 3, 0)					
3 (2 Lectures, 3 Lab, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 5/ Third year					
4. Course general Description:					
The course covers water, producing potable and fresh water from seawater and brackish water, and Manufacturing and industrial applications of primary inorganic materials. Mineral fertilizers, Silicate products, and Construction materials are among the topics covered in this course. Inorganic Pigments will be discussed in terms of application and manufacturing.					
5. Pre-requirements for this course (if any):					
Principles of Inorganic Chemistry - CHM 1110					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					

At the end of this course, the student will be able to:

- ✓ Enrich the student's knowledge of industries based on inorganic compounds
- ✓ Recognize the requirement for purification and production of potable water from different sources
- ✓ Outline the requirements and manufacturing processes in inorganic chemical industries.
- ✓ Develop awareness of the contributions of raw materials in KSA in inorganic chemistry industries
- ✓ Disclose the application and manufacturing of Silicate products, construction materials, oxide ceramics, and related industries
- ✓ Demonstrate the inorganic pigments and classify them according to their properties and usage.

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 recognize the requirement for purification and production of potable water from different sources**	**K1, K 4**	▪ **Four hours weekly, containing lectures and laboratory activities.** ▪ **A Private study, including a home exam**	**Direct:** ✓ **exams,** ✓ **Homework Laboratory Reports** ✓ **Participation**

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	To describe the most important inorganic elements and compounds regarding their production and applications	K1, K3	▪ Two hours of weekly lecture activities. ▪ Self-study	Direct: ✓exams, quizzes ✓Oral Discussion ✓Homework ✓Participation
1.3	To list the types of fertilizers and highlight their economy and manufacturing	K1, K4	▪ Four 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			
2.1	To differentiate between different inorganic industries and their methods of manufacturing inorganic materials.	S1; S2	• Introduce some Saudi inorganic industries to discuss and predict the optimum manufacturing • Brainstorming Exercises	Direct ✓ Questions in Lectures. ✓ Short Quizzes and Exams. ✓ Participation ✓ Homework
2.2	To evaluate the optimal methods for the synthesis of the different industrial compounds.	S2; S3	Group Discussions and Laboratory Experiments	Direct ✓ Questions in Lectures. ✓ Short Quizzes and Exams. ✓ Participation ✓ Laboratory reports
2.3	To develop optimum purification methods for industrial water waste using available raw materials	S1; S4	• Lectures, • laboratory activities • Oral Discussions. • Brainstorming Exercises	Direct ✓ Questions in Lectures. ✓ Short Quizzes ✓ Participation ✓ Laboratory reports
2.4	To use advanced digital technology in diagramming and	S3; S4	• Lectures,	Direct ✓ Homework

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	analyzing obtained data during laboratory classes and field tasks, demonstrating oral and network communication and technical writing skills		• laboratory activities, an • Oral Discussions. • Brainstorming Exercises	✓ Mini project ✓ Participation ✓ Laboratory reports
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate teamwork skills and maintain scientific integrity during the 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	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.	Water (Economic Importance, production of potable water, and production of freshwater from seawater and brackish water)	2
2.	Manufacturing and industrial applications of primary inorganic materials (hydrogen, hydrogen peroxide, ammonia, nitric acid, sulfuric acid, chlorine, and sodium hydroxide)	6
3.	Mineral fertilizers (potassium-containing fertilizers, phosphorous-containing fertilizers and nitrogen-containing fertilizers)	6
4.	Silicate products (glass, zeolites, and alkali silicates).	6
5.	Construction materials (lime, cement, gypsum).	6
6.	Enamel and ceramics.	2

7.	Inorganic Pigments (white pigments, colored pigments, corrosion protection pigments, luster pigments, luminescent pigments, magnetic pigments).	2
	TOTAL	**30**
No	**Practical Topics**	
Lab 1	Safety rules in the laboratory	3
Lab 2	Synthesis of a geo-polymer	3
Lab 3	Synthesis of glass	3
Lab 4	Preparation of a ceramic pigment	3
Lab 5	Cement Analysis (Determination of its specific weight)	3
Lab 6	Analysis of cement (Determination of total chlorine)	3
Lab 7	Analysis of cement (Determination of total water content)	3
Lab 8	Analysis of cement (Determination of chemically combined water)	3
Lab 9	Analysis of cement (Determination of aluminum oxide)	3
Lab 10	Analysis of (Determination of free lime)	3
Lab 11	Analysis of cement (Determination of magnesium oxide)	3
Lab 12	Analysis of calcium in a carbonate ore	3
Lab 13	Making Pure Silicon Dioxide	3
Lab 14	Purification of Silicon Dioxide from Sand	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	Karl Heinz Büchel, Hans-Heinrich Moretto, Dietmar Werner, Peter Woditsch, Karl Heniz Buchel, **Industrial Inorganic Chemistry**, ASIN : 3527298495, Wiley-VCH; 2nd Completely Revised edition (May 15, 2000), ISBN-10: 9783527298495, ISBN-13 : 978-3527298495
Supportive References	Some published papers in international journals
Electronic Materials	Blackboard
Other Learning Materials	None

2. Required Facilities and equipment

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.**

Items	Resources
	• **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. • **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-

Assessment Areas/Issues	Assessor	Assessment Methods
		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.

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

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