Course Specification
(Bachelor)

Course Title:	**Industrial Inorganic Chemistry**
Course Code:	**CHM 1312**
Program:	**Bachelor of Science in Chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	2-24 V1
Last Revision Date:	14 October 2024

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 2 (1,0, 3)					
2 (1 Lectures, 0 Tutorials, 3 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 5, 6/ year 3					
4. Course general Description:					
Topics covered in the course include the introduction on the Ceramics, in terms of classification, the raw materials, and advanced processes in the ceramic industries. The course will extend the Cement industry, Glasses and the Manufacturing procedure. Metallurgical Processes and Metals is one of the topics that will cover in this course.					
5. Pre-requirements for this course (if any)**:**					
Inorganic Chemistry (1) - CHM 1211					
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: • **To enrich the student's knowledge of the basic information for industrial requirements and preparation methods relevant to inorganic chemistry industries.** • **To develop awareness on the contributions of chemistry to industry KSA.** • **To disclose on the range and scope of the Saudi chemical industry relevant to provision of Silicate products, construction materials, oxide ceramics, and related industries**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**60**	**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**	**15**
2.	**Laboratory/Studio**	**45**
3.	**Field**	**0**
4.	**Tutorial**	**0**
5.	**Others (specify)**	**0**
Total		60

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 basic information of inorganic industrial chemistry.**	**K1, K3**	• Four hours weekly containing lectures and laboratory activities. • A Private study including home exam.	▪ Quizzes Assignments ▪ Discussions. ▪ Participation.
1.2	**To list the types of ceramics, glass, cements and metallurgy**	**K1, K2, K3**	• Four hours are weekly containing lectures, and group discussion • Laboratory activities • Group discussion.	• Quizzes Assignments. • Oral Discussion marks • Laboratory Reports
1.3	**To outline environmentally harmful substances and materials.**	**K1, K2**	• Four hours are weekly for laboratory activities • Think talk, and review environmentally harmful substances and materials.	• Quizzes • Home exam • Oral Discussions.
1.4	**To define the principles of safety, list emergency responses, and outline the routes of exposures to**	**K4**	• lectures and laboratory activities.	▪ Quizzes Assignments ▪ Discussions. ▪ Participation.

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	hazards, the minimization, and controlling and laboratory management.			
2.0	**Skills**			
2.1	**To recognize the basic information of inorganic industrial chemistry.**	**K1, K3**	Introduce some examples of inorganic industrial chemistry. In KSA	• Questions in Lectures. • Short Quizzes and Exams. • Participation • Oral Discussion • Home Exam.
2.2	**To list the types of ceramics, glass, cements and metallurgy**	**K1, K2, K3**	• Group Discussions • Laboratory Experiments	• Questions in Lectures. • Laboratory Reports • Short Quizzes and Exams. • Oral Discussion
2.3	**To outline environmentally harmful substances and materials.**	**K1, K2**	• Lectures • Oral Discussions. • Brainstorming Exercises	• Questions in Lectures.Short • Quizzes and Exams.
2.4	**To define the principles of safety, list of emergency responses and outline the routes of exposures to hazards, the minimization, and controlling and laboratory management.**	**K4**	Encourage the students to use the Chemicals, Glassware, and Instruments with caring and safety	• Assignments • Laboratory Report.
3.0	**Values, autonomy, and responsibility**			
3.1	**To appraise teamwork, and create awareness to maintain scientific integrity during different assessments,**	**V1, V2**	• Group discussion, assignments and homework • Lab-reports • Virtual labs and demonstrations	• Oral tests, • lab performance, Lab-reports • Sheets Marks • Assignments and homework marks

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	projects, and mini reports.			

C. Course Content

No	List of Topics	Contact Hours
1.	**Primary Inorganic Materials, Water: Water:** Economic Importance, Production of Potable Water, Filtration, Production of Soft or Deionized Water, Water Hardness and its treatment Nitrogen, Phosphorus, and Potash: Nitrogen-Containing Fertilizers: Economic Importance, General Information Importance of Ammonium Sulfate, Importance of Ammonium Nitrate, Importance of Urea, Manufacture of Nitrogen-Containing Fertilizers. Phosphorus and its Compounds, Phosphorus and Inorganic Phosphorus Compounds, Products, Phosphoric Acid, Phosphoric Acid Salts, Phosphorus. Potassium-Containing Fertilizers: Occurrence of Potassium Salts, Economic Importance of Potassium-Containing Fertilizers, Manufacture of Potassium-Containing Fertilizers N-P-K fertilizer: sources and forms of fertilizers.	4
2.	**Sulfur and Sulfur Compounds:** Sulfur and Sulfur Compounds: Sulfur, Economic Importance, Applications, Sulfuric Acid, Starting Materials for Sulfuric Acid Manufacture, Sulfuric Acid from Sulfur Dioxide Alkalis and Related Products: Lime and gypsum Burning. Portland Cement, Cement phases, Manufacture, hydration, types, factors affecting on the hydration. Soda Ash, Caustic Soda, The Chloralkali Industry. The Halogens: The Chlorine, Chlorofluorocarbons. Oxides and Oxoacids of Chlorine. Fluorine and Fluorine Compounds. Bromine and Iodine, Extraction, Uses and Hazards of Bromine.	4
3	**Ceramics and Glass:** Ceramics, Classification of Ceramics, Traditional Ceramics, Advanced Ceramics, Ceramics Raw Materials, Ceramic Manufacturing Processes, Advanced Processes. Glass, Composition of glass, Different varieties of glass, Special glasses, Properties of glass, Glass Raw materials, Chemical reactions of the formation, Manufacturing procedure.	4
4	**Extractive Metallurgy:** Extractive Metallurgy: Gravity and Flotation Methods of Ore Concentration, Hydrometallurgical Concentration and Separation, Separations Utilizing Special Properties, Electrolytic Reduction of Concentrate, Chemical Reduction of Concentrate, Pyrometallurgy of Oxides. Iron Production, Steelmaking. Pyrometallurgy of Halides and Sulfides. Titanium and Titanium Dioxide. Silicon. Metal Sulfides. Copper, Extraction.	**3**
Total		**15**

No	List of Experiments	Contact hours

1	Lab Safety and How to write a lab report	1
2	Analysis: PHOSPHATE (PO4-P)	5
3	Analysis: AMMONIA – NITROGEN (NH4 – N)	3
4	Analysis: SULFATE (SO4)-2	3
5	Analysis of calcium Carbonate Minerals	5
6	Analysis of calcium Carbonate Minerals: Determination of the percentage of loss on ignition	3
7	Determination of the Impure silica or acid insoluble matter	3
8	Determination of the amount of combined oxides impurities in carbonate ore	3
9	Determination of the amount of calcium in limestone	3
10	Determination of the water contents in cements: Determination of total water content, (Wt) & Determination of chemically combined water, (Wn):	4
11	Determination of Free water, (We):	3
12	Determination of available lime or free CaO in Cement	3
13	Preparation of glass and coloured glass & Colouring of glass sheet	3
14	Characterization and physical properties of glass & Determination of the durability of glass	3
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Attendance, Participation, Homeworks	All the semester	10 %
2.	Laboratory	All the semester	30 %
3.	Midterm Exam 1	Around 6th 7th week	10 %
4.	Midterm Exam 2	Around 11th 12th week	10%
5.	Final Exam	Around 16-17th week	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	**Industrial Inorganic Chemistry** , Karl H. Buchel, Hans H. Moretto and Peter Woditsch, , 2nd Ed. WILEY-VCH Verlag, CmbH. D-69469 Weinheim (Federal Republic of Germany), 2000 ,(ISBN: 3-527-29849-5
Supportive References	**Applied Chemistry, Theory and Practice**, O.P. Vermani, A.K. Narula, 2nd ed., 1995, New Age International (P) Ltd., Publishers Published by New Age International (P) Ltd., Publishers, ISBN (13) : 978-81-224-2494-2
Electronic Materials	• Blackboard http://www.chemistrylecturenotes.com/html/electrochemistry.html
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Each of the class room should be equipped with a whiteboard and a projector, with a maximum of 20 students. • In each laboratory, a list of safety and precautions are provided. • In each lab has proper ventilation, and well equipped with instruments. • In each lab, 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 Risks and safety precautions according to Merck Catalogue, are hanging in the labs.
Technology equipment (projector, smart board, software)	The rooms are equipped with data show, Smart Board, WI-FI access.
Other equipment (depending on the nature of the specialty)	• Appropriate Glasswares for carrying the requested experiments (burrete, pipets, conical flasks, beakers, measuring cyliders, curecibles, dishes, funnels, buchner, buchner flasks) • Appropriate fine chemicals and solvents (Calcium Carbonate, Silica. Carbonate ore, Cement) • Furnace Oven, Analytical balance (3 digits), Drying oven • Filter papers , clamps, stands

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Direct:** Questionnaire.

Assessment Areas/Issues	Assessor	Assessment Methods
	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. **Indirect:** Course report.
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.
	Program Leaders	**Indirect:** Exams.
Lab Performance	**Students** **Course Responsible**	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**7 (NO. 2/3)**
DATE	**29/3/1446 - 2/10/2024**