

CHEM3085: GEMOLOGICAL SCIENCE

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Gemological Science

Subject Code

CHEM - Chemistry

Course Number

3085

Academic Unit

Chemistry (CHEM)

College/School

College of Science (SI)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course introduces basic knowledge of gemology, in relation with chemistry and material science. The course is co-developed and co-taught with GIA Hong Kong Limited. Upon passing the course, students will be given a digital Diamond Essentials Certificate issued by GIA HK for recognition.

This course aims to:

- learn from the creator of 4C' s diamond grading system
- understand how modern technology changes the way diamonds are cut, the relationship between size and weight; the grading of the color and clarity;
- identify the chemical compositions and characteristics of colored gemstones and the role of color; apply the knowledges to make scientific identification and color determination of gemstones.
- comprehend the mining, extraction and purification processes of metals, and determine purity of precious metals by chemical and/or physical methods.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe internationally accepted clarity grading system of diamonds, gemstones and their colour grading and value;	20	x	x	
2	Explain how modern technology changes the way diamonds are cut, the relationship between size and weight; the grading of the color and clarity;	25	x	x	x
3	Critically identify the chemical compositions and characteristics of colored stones and the role of color; apply the knowledge to make scientific identification of gemstones.	30	x	x	
4	Identify the mining, extraction and purification processes of metals, and apply chemical principles to determine purity of precious metals.	25	x	x	

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1 Lectures, assignments and laboratory classes	Students shall attend the lectures, tutorials and practical training on diamonds.	1, 2	

2	Lectures, tutorials, presentations and assignments	Students will engage in lectures and tutorials about colored gemstones, jewelry and precious metals. Students need to do assignments on these topics and are required to give presentations in the class.	3, 4	
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Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments, individual presentations	1, 2, 3, 4	20	-	Yes
2	Tests	1, 2	10	The tests and laboratory classes are conducted by the teaching partner (GIA HK), and we will ensure compliance with the GIA' s requirements.	No
3	Laboratory classes and reports#	1, 2	10	The tests and laboratory classes are conducted by the teaching partner (GIA HK), and we will ensure compliance with the GIA' s requirements.	No

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

40

Additional Information for ATs

#Attendance of the 9-hour GIA' s practice training is required to pass the course.

Assessment Rubrics (AR)

Assessment Task

1. Assignments, individual presentations and Tests

Criterion

Ability to describe internationally accepted clarity grading system of diamonds, gemstones and their colour grading and value;

Ability to realize how modern technology changes the way diamonds are cut, the relationship between size and weight; the grading of the color and clarity;

Capacity to critically identify the chemical compositions and characteristics of colored stones and the role of color.

Application of the knowledge to make scientific identification of gemstones.

Ability to comprehend the mining, extraction and purification processes of metals, and apply chemical principles to determine purity of precious metals.

Excellent (A+, A, A-)

Student is expected to show strong evidence of subject matter and great familiarity with knowledge.

Good (B+, B, B-)

Student is expected to demonstrate evidence of subject, evidence of familiarity with knowledge.

Fair (C+, C, C-)

Student is expected to show little evidence of the subject and little familiarity with knowledge.

Marginal (D)

Student is expected to demonstrate sufficient familiarity with the subject matter and limited evidence of knowledge.

Failure (F)

Student shows no evidence of familiarity with the subject matter and irrelevant understanding of knowledge.

Assessment Task

2. Laboratory classes and report

Criterion

Ability to describe internationally accepted clarity grading system of diamonds and their colour grading and value;

Ability to realize how modern technology changes the way diamonds are cut, the relationship between size and weight; the grading of the color and clarity;

Excellent (A+, A, A-)

Student is expected to show excellent understanding to experiments, finish the laboratory reports flawlessly and be well prepared in the classes.

Good (B+, B, B-)

Student is expected to have good understanding to experiments, finish the laboratory reports satisfactorily, and be prepared in the classes.

Fair (C+, C, C-)

Student is expected to demonstrate some understanding to experiments, complete the laboratory reports.

Marginal (D)

Student shows little understanding to experiments and hand in the laboratory reports and little preparation in the classes.

Failure (F)

Student shows no understanding to experiments and/or do not hand in the laboratory reports.

Assessment Task

3. Examination

Criterion

Ability to describe internationally accepted clarity grading system of diamonds, gemstones and their colour grading and value;

Ability to realize how modern technology changes the way diamonds are cut, the relationship between size and weight; the grading of the color and clarity;

Capacity to critically identify the chemical compositions and characteristics of colored stones and the role of color.

Application of the knowledge to make scientific identification of gemstones.

Ability to comprehend the mining, extraction and purification processes of metals, and apply chemical principles to determine purity of precious metals.

Excellent (A+, A, A-)

Student is expected to show strong evidence of original thinking; good organization, capacity to analyse and synthesize the subject matter; superior grasp of knowledge is required.

Good (B+, B, B-)

Student is expected to demonstrate evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with knowledge.

Fair (C+, C, C-)

Student is expected to show little evidence of the subject, little evidence of critical capacity and analytic ability; fair understanding of issues.

Marginal (D)

Student is expected to demonstrate sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Student shows no evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant understanding of knowledge.

Part III Other Information

Keyword Syllabus

Diamonds (taught by GIA HK, ~6 weeks)

Learn from the creator of 4C's diamond grading system, how modern technology is changing the way diamonds are cut, how to describe diamond jewelry accurately and practical training on diamond grading.

Colored gemstones (CityUHK CHEM, ~4 weeks)

"Big Three" gemstones - ruby, sapphire and emerald. Chemical compositions and characteristics of colored stones. Important role of color. Chemical/physical identifications of gemstones. Natural vs treated vs laboratory-grown gemstones. Crystal phases. Artificial preparation. Practical applications.

Jewelry and precious metals (CityUHK CHEM, ~3 weeks)

Mining, extraction and purification of metals, crafting, determination of purity, crystal phases, nanostructures of precious metals, catalysis.

Teaching Plan

Week 1-6 (Venue: CityUHK classroom and GIA HK campus at Kowloon Bay)

Teaching activity: Guest lecturers from GIA HK give lecture for 3 weeks (3 hours of lecture and 1 hour of tutorial per week) and practical training for 3 weeks (3 hours per week)

Week 7-13 (Venue: CityUHK classroom)

Teaching activity: Academic staffs from CityUHK Chemistry department deliver lecture (3 hours of lecture and 1 hour of tutorial per week) and give assignments to students and hold individual presentations.

Exam (Venue: CityUHK)

Students will take a 2-hour closed-book final examination at CityUHK.

Reading List

Compulsory Readings

Title	
1	Gems: their sources, descriptions, and identification, Robert Webster. 5th ed.; revised by Peter G. Read. Oxford: Butterworth-Heinemann, c1994
2	Handbook of rocks, minerals, and gemstones, Walter Schumann; translated by R. Bradshaw and K.A.G. Mills. Boston: Houghton Mifflin, 1993
3	Simon & Schuster's Guide to gems and precious stones, Curzio Cipriani and Alessandro Borelli; Kennie Lyman, U.S. editor ; translated by Valerie Palmer. New York: Simon & Schuster, c1986