

DEPARTMENT OF CHEMISTRY

CHEM UG Courses

UG Courses offered in Summer Term 2025-2026 but the courses outlines are not time-specific

Course Code	Course Title
CHEM 1002	Introduction to Chemistry of Cosmetics
CHEM 1004	Chemistry in Everyday Life
CHEM 3610B	Chemistry Internship
CHEM 4680	Undergraduate Research
CHEM 4691	Capstone Research I

The Hong Kong University of Science and Technology

CHEM 1002

Syllabus, ILOs, Assessments and Grading

Course Title: Introduction to Chemistry of Cosmetics

Course Code: CHEM 1002

Number of Credit(s): 3

Pre-requisite: nil

Co-requisite: nil

Exclusion: nil

Name: Prof. CHAN, Ho Wai Dennis

Email: chanhw@ust.hk

Office Hours: By email appointments

Course Description

This course concentrates on the basic scientific principles in cosmetic science. Various topics with emphasis on molecular approach related to cosmetic products' formulation and proper uses of cosmetic products will be covered. Major topics include definition of cosmetics, make-up cosmetics, skin-care cosmetics, hair-care cosmetics, vehicles of cosmetic products, surfactants, colorants, alpha hydroxyl acids & beta hydroxyl acids, antioxidants and sunscreens, skin-whitening agents, hydrating substances / moisturizers, antiperspirants & deodorants and botanical ingredients.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. To identify fundamentals of chemistry and the scientific basis for cosmetic formulation. [ILO1]
2. To identify the contribution of scientists in cosmetic product design and developments. [ILO2]
3. To explain how active ingredients in cosmetics are suitable for specific intended functions. [ILO3]
4. To identify fundamentals of chemistry and the scientific basis for the function of the active ingredients of cosmetics. [ILO4]

Assessment and Grading

Summary:

Assessment Task	Contribution to Overall Course grade (%)	Covering topics
Homework	15%	HW1 before mid-term test HW2 before final examination
Quiz	15%	Covering topics 1 to 2
Mid-term Test	35%	Covering topics 1 to 5 (basic concepts in cosmetic chemistry and chemistry of haircare products)
Final Examination	35%	Covering topics 6 to 11 (concepts in chemistry in skincare products)

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO2, ILO3, ILO4	These tasks assess students' understanding of the contributions of chemists to technological innovations in modern personal care products (ILO2), while also reinforcing their grasp of fundamental chemistry concepts related to cosmetic formulations (ILO1). Additionally, these assignments evaluate students' ability to apply chemistry concepts to explain cosmetic technologies and inventions (ILO4) and describe how active ingredients are suitable for specific intended functions (ILO3).
Quiz	ILO1, ILO2, ILO3, ILO4	This short task evaluates students' comprehension of basic chemistry concepts in cosmetic science and the contributions of chemists to the industry (ILO1, ILO2). It also evaluates students' ability to apply their knowledge of chemistry to explain various cosmetic technologies (ILO4) and help them explain how active ingredients are suitable for specific intended functions in cosmetic products (ILO3).
Mid-term Test	ILO1, ILO2, ILO3, ILO4	This assessment measures students' understanding of the contributions of chemists to technological innovations in personal care products (ILO2) and their foundational knowledge of chemistry concepts applicable to cosmetic formulations (ILO1). This test also evaluates students' ability to utilize chemistry concepts to analyze cosmetic technologies (ILO4) and to explain how active ingredients are suitable for specific intended functions in haircare cosmetic products (ILO3).
Final Examination	ILO1, ILO2, ILO3, ILO4	The final examination assesses students' overall understanding of the contributions of chemists to modern personal care products (ILO2) and their ability to apply fundamental chemistry concepts to cosmetic formulations (ILO1). It also evaluates their capability to explain cosmetic technologies and inventions using chemistry principles (ILO4) and reinforces their understanding of why active ingredients are suitable for specific intended functions in skincare cosmetic products (ILO3).

Grading Rubrics

Criteria	Excellent (9-10/10)	Good (7-8/10)	Satisfactory (5-6/10)	Marginal (3-4/10)	Fail (0-2/10)	Mapping to course ILO(s)
Homework	Demonstrates exceptional understanding of the fundamental chemistry principles related to cosmetic formulations and technologies. Thoroughly identifies and explains multiple contributions of chemists to modern personal care products. Displays a profound understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows thorough and insightful analysis and applies chemical concepts to explain cosmetic technologies and inventions.	Demonstrates solid grasp of the fundamental chemistry concepts in cosmetic formulations and technologies. Clearly identifies and explains multiple contributions of chemists to modern personal care products. Displays understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows solid grasp of applying chemical concepts to explain cosmetic technologies and inventions though some minor details may be overlooked.	Demonstrates satisfactory understanding of the fundamental chemistry concepts in cosmetic formulations and technologies. Identifies and explains some contributions of chemists to modern personal care products. Displays limited understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows a satisfactory understanding of chemical concepts for explaining cosmetic technologies and inventions.	Demonstrates limited understanding of the fundamental chemistry concepts in cosmetic formulations and technologies. Lacks in-depth understanding of the contributions of chemists to modern personal care products. Displays very limited understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows limited understanding of chemical concepts for explaining cosmetic technologies and inventions.	Fails to meet minimum expectations for the fundamental chemistry concepts in cosmetic formulations and technologies. Fails to meet minimum expectations for understanding of the contributions of chemists to modern personal care products. Displays almost no understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows almost no understanding of chemical concepts for explaining cosmetic technologies and inventions.	ILO1, ILO2, ILO3, ILO4
Quiz	Demonstrates exceptional understanding of the fundamental chemistry principles related to cosmetic formulations and technologies. Thoroughly identifies and explains multiple contributions of chemists to modern personal care products. Displays a profound understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows thorough and insightful analysis and applies chemical concepts to explain cosmetic technologies and inventions.	Demonstrates solid grasp of the fundamental chemistry concepts in cosmetic formulations and technologies. Clearly identifies and explains multiple contributions of chemists to modern personal care products. Displays understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows solid grasp of applying chemical concepts to explain cosmetic technologies and inventions though some minor details may be overlooked.	Demonstrates satisfactory understanding of the fundamental chemistry concepts in cosmetic formulations and technologies. Identifies and explains some contributions of chemists to modern personal care products. Displays limited understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows a satisfactory understanding of chemical concepts for explaining cosmetic technologies and inventions.	Demonstrates limited understanding of the fundamental chemistry concepts in cosmetic formulations and technologies. Lacks in-depth understanding of the contributions of chemists to modern personal care products. Displays very limited understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows limited understanding of chemical concepts for explaining cosmetic technologies and inventions.	Fails to meet minimum expectations for the fundamental chemistry concepts in cosmetic formulations and technologies. Fails to meet minimum expectations for understanding of the contributions of chemists to modern personal care products. Displays almost no understanding of how active ingredients are suitable for specific intended functions in cosmetic products. Shows almost no understanding of chemical concepts for explaining cosmetic technologies and inventions.	ILO1, ILO2, ILO3, ILO4

Mid-term Test	Demonstrates exceptional understanding of the fundamental chemistry principles related to haircare cosmetic formulations and technologies. Thoroughly identifies and explains multiple contributions of chemists to modern haircare products. Displays a profound understanding of how active ingredients are suitable for specific intended functions in haircare products. Shows thorough and insightful analysis and applies chemical concepts to explain cosmetic technologies and inventions for haircare.	Demonstrates solid grasp of the fundamental chemistry concepts in haircare cosmetic formulations and technologies. Clearly identifies and explains multiple contributions of chemists to modern haircare products. Displays understanding of how active ingredients are suitable for specific intended functions in haircare products. Shows solid grasp of applying chemical concepts to explain cosmetic technologies and inventions for haircare, though some minor details may be overlooked.	Demonstrates satisfactory understanding of the fundamental chemistry concepts in haircare cosmetic formulations and technologies. Identifies and explains some contributions of chemists to modern haircare products. Displays limited understanding of how active ingredients are suitable for specific intended functions in haircare products. Shows a satisfactory understanding of chemical concepts for explaining cosmetic technologies and inventions for haircare.	Demonstrates limited understanding of the fundamental chemistry concepts in haircare cosmetic formulations and technologies. Lacks in-depth understanding of the contributions of chemists to modern haircare products. Displays very limited understanding of how active ingredients are suitable for specific intended functions in haircare products. Shows limited understanding of chemical concepts for explaining cosmetic technologies and inventions for haircare.	Fails to meet minimum expectations for the fundamental chemistry concepts in haircare cosmetic formulations and technologies. Fails to meet minimum expectations for understanding of the contributions of chemists to modern haircare products. Displays almost no understanding of how active ingredients are suitable for specific intended functions in haircare products. Shows almost no understanding of chemical concepts for explaining cosmetic technologies and inventions for haircare.	ILO1, ILO2, ILO3, ILO4
Final Examination	Demonstrates exceptional understanding of the fundamental chemistry principles related to skincare cosmetic formulations and technologies. Thoroughly identifies and explains multiple contributions of chemists to modern skincare products. Displays a profound understanding of how active ingredients are suitable for specific intended functions in skincare products. Shows thorough and insightful analysis and applies chemical concepts to explain cosmetic technologies and inventions for skincare.	Demonstrates solid grasp of the fundamental chemistry concepts in skincare cosmetic formulations and technologies. Clearly identifies and explains multiple contributions of chemists to modern skincare products. Displays understanding of how active ingredients are suitable for specific intended functions in skincare products. Shows solid grasp of applying chemical concepts to explain cosmetic technologies and inventions for skincare, though some minor details may be overlooked.	Demonstrates satisfactory understanding of the fundamental chemistry concepts in skincare cosmetic formulations and technologies. Identifies and explains some contributions of chemists to modern skincare products. Displays limited understanding of how active ingredients are suitable for specific intended functions in skincare products. Shows a satisfactory understanding of chemical concepts for explaining cosmetic technologies and inventions for skincare.	Demonstrates limited understanding of the fundamental chemistry concepts in skincare cosmetic formulations and technologies. Lacks in-depth understanding of the contributions of chemists to modern skincare products. Displays very limited understanding of how active ingredients are suitable for specific intended functions in skincare products. Shows limited understanding of chemical concepts for explaining cosmetic technologies and inventions for skincare.	Fails to meet minimum expectations for the fundamental chemistry concepts in skincare cosmetic formulations and technologies. Fails to meet minimum expectations for understanding of the contributions of chemists to modern skincare products. Displays almost no understanding of how active ingredients are suitable for specific intended functions in skincare products. Shows almost no understanding of chemical concepts for explaining cosmetic technologies and inventions for skincare.	ILO1, ILO2, ILO3, ILO4

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates exceptional understanding of the chemistry principles underlying cosmetic formulations and technologies, and shows meticulous attention to detail in assignments, quizzes, and examinations. Consistently provides insightful analysis and application of chemistry concepts. Displays a deep appreciation for the contributions of chemists in the cosmetic industry.
B	Good Performance	Displays a solid grasp of the fundamental chemistry concepts in cosmetic formulations and technologies, and effectively applies this knowledge in assignments, quizzes, and examinations. Provides sound analysis and application of chemistry concepts. Demonstrates understanding of the role of chemists in product design. Displays an appreciation for the contributions of chemists in the cosmetic industry.
C	Satisfactory Performance	Shows a satisfactory understanding of basic chemistry concepts in cosmetic formulations and technologies, and completes assignments, quizzes, and examinations with an acceptable level of accuracy in the application of chemistry principles. Shows limited appreciation for the role of chemists in the cosmetic industry.
D	Marginal Pass	Demonstrates limited understanding of the key chemistry concepts in cosmetic formulations and technologies. Shows inconsistencies in completing assignments and examinations, with noticeable gaps in knowledge and application of theoretical concepts. Shows very limited appreciation for the role of chemists in the cosmetic industry.
F	Fail	Fails to meet minimum expectations for understanding and applying chemistry concepts in cosmetic formulations and technologies. Exhibits significant deficiencies in knowledge, execution of assignments, and analysis of material and lacks basic skills in connecting theoretical principles to practical applications. Displays almost no appreciation for the contributions of chemists in the cosmetic industry.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within one week of submission. Students who have questions about the scores should consult the corresponding TA within seven days after the feedback is received.

Required Texts and Materials

- No specific textbook
- Course handouts can be downloaded/viewed by logging in to the CANVAS website using your ITSU username and password (<https://canvas.ust.hk>).

Additional Resources

Reference books:

- [1] Hilda Butler (editor), *Poucher's Perfumes, Cosmetics, and Soaps, 10th edition*, Dordrecht: Kluwer Academic Publishers © **2010**. [call nr.: TP983.P723 2010] or Hilda Butler (editor), *Poucher's Perfumes, Cosmetics, and Soaps, 10th edition*, Dordrecht: Springer-Science+Business Media, B.V. © **2000**. §§
- [2] Zoe D. Draelos; Lauren A. Thaman (editors), *Cosmetic Formulation of Skin Care Products*, New York: Taylor & Francis © **2006**. [call nr.: TP983.3.C67 2006] §§
- [3] Nava Dayan (editor), *Skin Aging Handbook: An Integrated Approach to Biochemistry and Product Development*, New York: William Andrew Inc. © **2008**. [call nr.: QP88.5.S553 2008] §§
- [4] Linda D. Williams, *Chemistry Demystified*, New York: McGraw-Hill © **2003**. [call nr.: QD33.2.W54 2003] §§ or the same title published in 2011 [call nr.: QD37.W48 2011]
- [5] Anthony J. O'Lenick Jr.; Thomas G. O'Lenick, *Organic Chemistry for Cosmetic Chemists*, Carol Stream, IL: Allured Publishing, © **2008** [call nr.: TP983.O445 2008]

§§: denotes an electronic version (e-book) is available in HKUST library and can be accessed using campus Wi-Fi network. For the remaining, you can borrow them from HKUST library's Course Reserves Collection.

Course AI Policy

In homework, students are allowed to use generative artificial intelligence (AI) to aid them in any manner. In quiz, midterm test and final examination are closed-book assessments. No AI is allowed in these assessments.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct.

Please refer to [Academic Integrity | HKUST – Academic Registry](#) for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Keyword syllabus

1. Cosmetics & Chemists' Perspective; Classification & Production of Cosmetics
2. Vehicles in Cosmetics; Extractions of Botanical Ingredients
3. Surfactants in Cosmetics
4. Hair-Care Cosmetics: Shampoos, Hair-Conditioners and Treatment
5. Hair Waving & Hair Colors
6. Color Cosmetics: Essence of Makeup
7. Skincare: Cleansing, AHAs and BHAs
8. Photoaging and Antioxidants
9. Skin-whitening Agents
10. Sunscreens
11. Antiperspirants & Deodorants

CHEM 1004 – Chemistry in Everyday Life

Summer Semester 2025-26

3 credits

Lectures: Rm 2504 (Lift 25/26)
Monday, Wednesday and Friday
02:00 pm – 05:50 pm

No lectures on Jun 19 & July 1

Course Instructors: **Prof. Emily M.W. TSANG**
Assistant Professor of Science Education
Department of Chemistry, HKUST

Email: chetsang@ust.hk
Office: Rm 4535 (4/F, Lift 25/26)

Dr. Frederick F.K. SHEONG
Lecturer II
Department of Chemistry, HKUST

Email: chemfksheong@ust.hk
Office: Rm 4542 (4/F, Lift 25/26)

Course website: <https://canvas.ust.hk>

Course Description

CHEM 1004 is a common core course provided for students who have never taken a Chemistry course, but would like to learn what chemistry is and how it may affect the world we live in.

Course Outline

The course is divided into six Chapters:

- Chapter 1: What is everything made of?
- Chapter 2: The Air.
- Chapter 3: The air and our environment.
- Chapter 4: The metals in our daily life.
- Chapter 5: Metals in the industry.
- Chapter 6: Fire and fuels.

Lectures

Attendance of lectures will contribute to 5% of your overall course grade. The lectures are critical to your understanding of course materials. We will show some interesting experiments during some of the classes and they are best viewed in person. Lecture recordings will be provided on Canvas after **each class**, so please catch up promptly when you missed a class.

Course Contents

Comprehensive **lecture notes** will be provided for this course. These notes should be very helpful to you as they provide more details of the lecture materials than power point slides. However, the version of the notes you receive is incomplete. You will need to fill in some important details or draw diagrams to complete the notes during the lectures.

You should print out hard copies of the lecture notes and bring them to the class. You can staple each chapter's notes into a booklet.

It would be advisable to print them single sided, so that you can use the blank page to jot down extra notes that the lecturer mentions but are not in the notes, or to write some references you obtained from other sources or your revision notes.

The **power point slides** will be mostly pictures or graphics. The slides will be released on Canvas.

The lecture notes will be released by chapter. New chapters will be released on Canvas towards the end of the current chapter. You can read through the notes before the lecture to familiarise yourself with the materials.

Textbooks/Reading List

You don't need a textbook for this course, and since we draw examples from many different areas of chemistry in everyday life, no one textbook is a perfect fit for the course. Therefore, for each chapter, some reading materials will be suggested to you for optional reference.

End of Chapter Exercises and Tutorial Sessions

To help you prepare for the examination, each chapter will finish with a short **exercise**. These exercises will require you to work through a set of problems, using some knowledge from the lectures and also to teach you some new knowledge through the exercise.

These exercises will **not** be formally graded, but they will be examinable.

Office Hours of the Instructor

Please feel free to approach the instructor, Prof. Emily Tsang and Dr. Frederick Sheong to ask questions or to discuss any chemistry or course-related issues. You may approach her after the lectures, or you may email her to arrange an appointment. There is no fixed office hour schedule: if you need one, feel free to email and book a time.

Online Graded Quizzes (15 % of the course)

There will be two online **graded** quizzes. The accumulated points from the online quizzes will carry 15 % to the course grade, but the main purpose is to help you further understand the course materials and have a chance to practice and receive answers immediately after submission. When these quizzes are available, you will receive email notification as well as instructions during the lectures.

On-campus Proctored Examinations (80 %)

On-campus proctored examinations: Midterm (40%) (Jun 29) and Final Exam (40%) (July 10): These exams will cover all the lecture materials and exercises that were taught in the course. You will mainly be tested on your understanding and ability to solve problems rather than solely on the memorisation of facts, but you should also be familiar with some key chemical details – some of these will inevitably require some memorisation.

Grades

The final grade for the course will be consisted of:

5% from the Lecture Attendance

15% from the 2 Online Quizzes

40% from the Midterm (Jun 29 (Mon))

40% from the Final Exam (July 10 (Fri))

The course is graded from A+ to F. An F grade will not earn you credits for the course.

Intended Learning Outcomes (ILOs)

At the end of the course, the students will have:

1. Explain basic fundamental concepts of Chemistry, recognize basic chemical terminology and be able to perform simple chemical calculations.
2. Demonstrate an understanding of how Chemistry connects with our everyday experience, modern technology, and environmental sustainability issues.
3. Explain the basic Chemistry behind major environmental issues, common household items, and important industrial processes
4. Obtain scientific information on chemistry topics of everyday and environmental relevance and to think critically from a chemistry perspective.

Assessment Scheme

Weight	Assessment	Course ILOs	CHEM Program ILOs
5%	Attendance	4	D1, D3
15%	Online Revision Quiz	1, 2, 3, 4	A1, A2, A3, B1, B4
40%	Midterm Exam	1, 2, 3, 4	A1, A2, A3, B1, B4
40%	Final Exam	1, 2, 3, 4	A1, A2, A3, B1, B4

Teaching and Learning Activities (Non-assessed)

Activities	Course ILOs	CHEM Program ILOs
Lecture	1, 2, 3, 4	A1, A2, A3, B1, B4, D1, D3
End of chapter exercises and Tutorials	1, 2, 3, 4	A1, A2, A3, B1, B4

Topics by Chapter

Chapter 1: What is everything made of?	~2 Lectures	Introduction of the course
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		Discovery of the atomic structure Elements; relative atomic mass relative molecular mass The mole Chemical calculations Relationship between mole and mass, mole and concentration, mole and gas volume Calculations, Common elements
Chapter 2: The Air	~3 Lectures	Gases in the Air, Electronic configuration Forming covalent bonds States of matter, separation of gases in air, Intermolecular forces: London dispersion force Electronegativity, Polar and non-polar molecules, Intermolecular forces: dipole-dipole interactions
Chapter 3: The air and our environment	~5 Lectures	Electromagnetic waves Greenhouse gases, Greenhouse effect, Global Warming, Carbon cycle, Reducing CO₂ emission Acids and Bases Air Pollution: Acid Rain and other air pollutants Reading organic chemical structures Air Pollution: VOCs, smog, PMs Controlling air pollution Ozone and ozone depletion
Chapter 4: The metals in our daily life	~5 Lectures	Different groups of metals in the periodic table: Alkali metals, Alkaline earth metals, Transition metals, Lanthanides, metals in Group 13-15, Radioactivity and the Actinide elements Structure of Metals, Metallic bonding Metal lattice systems Physical properties of typical metals; Alloys Alloys: types and applications Compounds of metals: Ionic bonding Name and Formula of ionic compounds

		Structure of complex ions Solid structure of ionic compounds Ionic lattice systems Physical properties of ionic compounds Reaction of metals with oxygen Reaction of metals with water Reaction of metals with acids
Chapter 5: Metals in the industry	~6 Lectures	Metal extraction industry Calculate %mass of metal in a compound Redox Oxidation number Metal displacement reactions Metal displacement reactions Extraction of Metals by heating with carbon: Copper, Iron (Blast Furnace, Basic Oxygen Converter) Electrolysis of molten ionic compounds: Extraction of sodium Electrolysis of molten ionic compounds: Extraction of aluminium Electrolysis of aqueous solution The chloroalkali industry The refining of copper metal Electroplating Anodising aluminium Half cells and standard electrode potentials Electrochemical cells Fruit batteries, zinc-carbon batteries Alkaline batteries Silver oxide cells Rechargeable batteries: Ni-MH batteries Lithium metal batteries Lithium-ion batteries

Chapter 6: Fire and fuels	~3 Lectures	Fire and combustion, Fire triangle How to fight a fire Fire extinguishers Introduction to fossil fuels: coal, natural gas and crude oil Alkanes: naming and isomers Fractional distillation of crude oil Fractions from crude oil Cracking Alkenes Polymers Calculating energy from combustion reactions Starting a fire Fireworks Explosives
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The Hong Kong University of Science and Technology

CHEM3610B

Syllabus, ILOs, Assessments and Grading

Course Title: Chemistry Internship

Course Code: CHEM3610B

No. of Credit(s): 3

Pre-requisites and Co-requisites: nil

Exclusion: nil

Name: Prof. CHAN, Ho Wai Dennis

Email: chanhw@ust.hk

Office Hours: By email appointments

Course Description

This course provides students with the opportunity to gain work experience in chemistry field. Students will undertake training and supervised internships in our collaborating companies/organizations/units. For CHEM students with instructor's approval only. Graded P or F.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. apply academic knowledge to real-life situations. [ILO1]
2. Communicate with professionals. [ILO2]
3. Work independently and collaborate in teamwork. [ILO3]
4. Reflect on their learning progress and develop motivation in lifelong learning. [ILO4]

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Initial report	10%	19/06/2026
Oral Presentation	20%	17/08/2026
Final report	30%	25/08/2026
Performance Evaluation	40%	25/08/2026

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Initial report	ILO2	This task assesses students' ability to communicate with supervisors in the workplace.
Oral Presentation	ILO2 and ILO4	This task assesses students' ability to communicate with different audiences with scientific language in workplace about technical and work-related issues. This task also assesses students' ability to reflect on their learning progress.
Final report	ILO4	This task assesses students' ability to apply scientific language in the workplace and to communicate with different audiences about technical and work-related issues. This task also assesses students' ability to reflect on their learning progress.
Performance Evaluation	ILO1, ILO2 and ILO3	Supervisor of the intern evaluates students' work performance and teamwork quality.

Grading Rubrics

Rubrics for the initial report:

Criteria	Excellent (A)	Good (B)	Satisfactory (C)	Needs improvement (F)	Weight
Description of the duties assigned	Clear, thorough description of both routine duties and specific project, demonstrating strong understanding of the role.	Adequate description of routine and project tasks, generally clear with minor details missing.	Basic description with some important details lacking or unclear.	Incomplete or Vague description, lacking clarity or relevant information.	75%
Expectations from the internship program	Clear, realistic learning goals and targets aligned with internship tasks.	Specific goals stated but somewhat general	Vague or general expectations	No clear expectations	25%

Rubrics for the oral presentation:

Criteria	Excellent (A)	Good (B)	Satisfactory (C)	Needs improvement (F)	Weight
Description of the tasks and duties assigned	Clear, thorough description of both routine duties and specific project, demonstrating strong understanding of the role.	Adequate description of routine and project tasks, generally clear with minor details missing.	Basic description with some important details lacking or unclear.	Incomplete or vague description, lacking clarity or relevant information.	25%
Knowledge Applied, and Gains from this Internship Program	Insightful and precise explanation of how specific chemistry concepts or skills from HKUST have been applied.	Reasonable connection of study knowledge to work tasks with some examples.	Minimal or vague reference to knowledge applied, lacking specific examples.	No clear connection between academic knowledge and internship tasks.	25%
Difficulties Encountered, their Solutions, and Personal Reflections	Describes specific challenges with thoughtful and effective strategies to overcome challenges. Demonstrates thorough personal reflections	Identifies challenges and basic approaches to resolving them. Demonstrates reasonable personal reflections	Mentions challenges but provides limited or unclear solutions. shows minimal personal reflections	Challenges are not identified or no attempt to explain how they were addressed. Demonstrates almost no personal reflections	25%
Clarity, Organization & Presentation	well organized the report. Make it logically structured, free of major errors, and easy to read. Uses professional language.	The report is mostly organized with minor errors in language or structure, generally clear.	The report is somewhat disorganized or contains noticeable errors that affect readability.	The report is poorly organized, unclear, or contains many errors that impair understanding.	25%

Rubrics for the final report:

Criteria	Excellent (A)	Good (B)	Satisfactory (C)	Needs improvement (F)	Weight
Description of the tasks and duties assigned	Clear, thorough description of both routine duties and specific project, demonstrating strong understanding of the role.	Adequate description of routine and project tasks, generally clear with minor details missing.	Basic description with some important details lacking or unclear.	Incomplete or vague description, lacking clarity or relevant information.	25%
Knowledge Applied, and Gains from this Internship Program	Insightful and precise explanation of how specific chemistry concepts or skills from HKUST have been applied.	Reasonable connection of study knowledge to work tasks with some examples.	Minimal or vague reference to knowledge applied, lacking specific examples.	No clear connection between academic knowledge and internship tasks.	25%
Difficulties Encountered, their Solutions, and Personal Reflections	Describes specific challenges with thoughtful and effective strategies to overcome challenges. Demonstrates thorough personal reflections	Identifies challenges and basic approaches to resolving them. Demonstrates reasonable personal reflections	Mentions challenges but provides limited or unclear solutions. shows minimal personal reflections	Challenges are not identified or no attempt to explain how they were addressed. Demonstrates almost no personal reflections	25%
Clarity, Organization & Presentation	The report is well organized. It is logically structured, free of major errors, and easy to read. Uses professional language. Photograph(s) taken on your internship site is included in the report for illustration of the job duties, and personal connections gained in the workplace.	The report is mostly organized with minor errors in language or structure, generally clear.	The report is somewhat disorganized or contains noticeable errors that affect readability.	The report is poorly organized, unclear, or contains many errors that impair understanding.	25%

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
P	Excellent/Good/Satisfactory Performance	Demonstrates: (i) a comprehensive application of chemistry knowledge in work situations, (ii) effective communication with professionals, (iii) ability to work independently and collaborate in teamwork in the workplace, and (iv) thorough personal reflection on his/her learning progress and develop motivations in lifelong learning
F	Fail	Insufficient working hours in the internship. Demonstrates insufficient application of chemistry knowledge in the workplace. Shows very limited ability to think critically in personal reflection and exhibits minimal effort towards achieving job requirements. Does not meet the threshold requirements for professional practice based on the evaluation from the supervisor.

Course AI Policy

In this course, you are allowed to use generative artificial intelligence (AI) to aid you for learning purposes.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have further questions about the feedback, including marks, should consult the instructor within five working days after the feedback is received.

Late Submission Policy

Late submission of assessments will not be considered. Zero score will be given for late submissions of the tasks.

Required Texts and Materials

None

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to [Academic Integrity | HKUST – Academic Registry](#) for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

The Hong Kong University of Science and Technology
UG Course Syllabus

Undergraduate Research

CHEM 4680

3 Credits

Prerequisite(s): CHEM 2550

Instructor(s): Research Faculties of Chemistry Department

Course Description

Brief Information/synopsis:

Students do original research in accordance with their ability and background, and under the supervision of a research faculty. The final course grade is determined based on an oral presentation and a written report to be submitted to a judging committee, which includes the faculty supervisor plus at least one other faculty. Enrollment in the course requires approval of the faculty supervisor.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Work independently, to handle and use appropriate instrumentation, interpret data, and complete given tasks in a research setting, and to prepare a written report.
2. Communicate more effectively in speaking and writing, both about students' newly acquired knowledge and knowledge in general.
3. Recognize deficiencies in knowledge existing in chemistry, and plan and mount a research study to address these deficiencies.
4. More critically assess data presented in textbooks, the primary literature or other sources, e.g. electronic databases, patents.
5. Appreciate the importance of research in relation to science, the definition of problems in research, and the corpus of scientific knowledge is able to expand through the overall research effort for the betterment of humankind.

Course Requirements and Grading

At the end of the course, **students are required to give an oral presentation and submit a written report to document their project work.** Course grades will be determined by a faculty panel consisting of their research supervisor and at least one other faculty member. Students will be evaluated based on their research performance, oral presentation (including the Q&A session), and written report.

CHEM 4691 Capstone Research I
Course Outline (Summer 2025/26)

1. Course Description

Pre-requisite: CHEM 3550 and CHEM 3555

Exclusion: CHEM 4689

Instructor(s)/Project Supervisor(s): Research Faculties of Chemistry Department

Course Coordinator: Prof. Emily M.W. Tsang

Reference Librarians:

Mr. Samson CHOI (lbsamson@ust.hk)

Ms. Hongyi GONG (lbhongyi@ust.hk)

Brief Information/synopsis:

This is a project-based course that provides students an opportunity to integrate and apply their chemical knowledge learnt in regular lecture and lab courses. Students will carry out a research project under the supervision of a faculty member/teaching staff. At the end of the course, students are required to submit a written report and deliver an oral presentation to document their learning experiences. Students should seek instructor's approval prior to enrollment in the course.

2. Intended Learning Outcomes

Upon successful completion of this course, students are expected to be able to:

1	Demonstrate awareness of chemical topics relevant to social and daily life.
2	Analyze and interpret experimental data, critically assess data in literature and extract useful data from it.
3	Carry out directed research by selecting appropriate topics and procedures, and presenting the results.
4	Communicate effectively both orally and in writing with professionals and/or lay audience.
5	Demonstrate information technology skills, especially in the areas of information retrieval, literature searching and use of library database.
6	Show self-awareness, work independently and collaborate effectively with other people in a team.

3. Grading

<u>Weight</u>	<u>Assessment</u>	<u>Course ILOs</u>
50%	Lab Performance and Participation	1,2,3,4,5,6
30%	Written Research Thesis	1,2,3,4,5
20%	Oral Presentation	4,5,6

4. **Mandatory Library Trainings Schedule:**

The following library training workshops are *mandatory*. Attendances will be taken and counted towards your course participation scores.

Date	Activity	Venue
Jun 16 (Tues), 11:00 – 11:50 am	Library Workshop I: Literature Search Training	Multi-Function Room, LG4. Library (Mr. Samson Choi/Ms. Hongyi Gong)
Jun 18 (Thurs), 11:00 – 11:50 am	Library Workshop II - Referencing Training	IC Learning Space, G/F, Library (Mr. Samson Choi/Ms. Hongyi Gong)
Jun 23 (Tues), 11:00 – 11:50 am	Chemical Structure Drawing Training	IC Learning Space, G/F, Library (Prof. Emily Tsang)
Jun 25 (Thurs), 11:00 – 11:50 am	SciFinder-n Workshop	Zoom Meeting (meeting link to be provided)