



## UNSW Course Outline

# CHEM1811 Engineering Chemistry 1A - 2024

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## General Course Information

**Course Code :** CHEM1811

**Year :** 2024

**Term :** Term 1

**Teaching Period :** T1

**Is a multi-term course? :** No

**Faculty :** Faculty of Science

**Academic Unit :** School of Chemistry

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Undergraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This is a first-year course with a focus on chemical engineering and food science applications.

This course is also a good elective for first year engineering students. Through weekly online tasks, live lectures, labs and tutorials, students build on their introductory knowledge of

chemistry to explore the engineering aspects of chemistry. The course builds from the quantum mechanical structure of atoms and leads to an understanding of the periodic trends in the properties of the elements. This knowledge is applied to understanding chemical bonding and intermolecular forces which together are responsible for determining the properties of materials.

General principles of chemical equilibrium are developed and applied to chemical reactions involving acids and bases. The practical aspects of the flow of material and energy within a process are extended into applications of the laws of thermodynamics to chemical processes and ultimately linked to chemical equilibrium. The course concludes with an overview of chemical reactions involving electron transfer, including their applications in biology, corrosion, and energy storage for portable electronic devices. This course is distinct from CHEM1011/1031 in being for engineering and food science students. It is usually taken in combination with CHEM1821.

Note: Assumed knowledge equivalent to Year 12 chemistry or CHEM1001.

## Course Aims

The overall aim of this course is to introduce the student to the broader context of chemistry within engineering and food science disciplines, including working through real-life applications and problems.

This course will provide a sound understanding of the physical principles underlying modern chemistry and its applications. This is supported by significant laboratory work which prepares a student for further studies in chemical engineering and food science, as well as instilling an appreciation of safe working practices in a laboratory.

The course will deepen understanding of the structures of atoms and molecules, relating these to the chemical properties of substances and identifying routes to control chemistry. The connection between energy changes and other thermodynamic functions and chemical reactions will also be introduced and investigated.

## Relationship to Other Courses

This course is a prerequisite for CHEM1821 (Engineering Chemistry 1B). Together, these two courses provide the chemistry knowledge that will underpin engineering/food science students' chemical education.

# Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe atomic, molecular and intermolecular structures using fundamental theory and apply this to chemical reactions including redox and acid/base reactions.
CLO2 : Analyse reactions in batch and continuous processes and calculate the material and energy balances for the system based on the thermodynamic properties of fluids and solids.
CLO3 : Analyse the thermodynamic aspects of chemical and physical processes to predict the spontaneity of processes and calculate the overall heat and work transfer.
CLO4 : Describe the principles of chemical equilibrium and apply this to phase behaviour and to chemical reactions.
CLO5 : Work safely in a laboratory to manipulate apparatus, perform quantitative and qualitative chemical analysis, evaluate the accuracy and precision of measurements, and to interpret results and observations.
CLO6 : Report the results of experiments by evaluating data and clearly communicating activities and findings.

Course Learning Outcomes	Assessment Item
CLO1 : Describe atomic, molecular and intermolecular structures using fundamental theory and apply this to chemical reactions including redox and acid/base reactions.	<ul style="list-style-type: none"><li>• Weekly threshold quizzes</li><li>• Laboratory work</li><li>• In-term tests</li><li>• Final examination</li></ul>
CLO2 : Analyse reactions in batch and continuous processes and calculate the material and energy balances for the system based on the thermodynamic properties of fluids and solids.	<ul style="list-style-type: none"><li>• Weekly threshold quizzes</li><li>• Laboratory work</li><li>• In-term tests</li><li>• Final examination</li></ul>
CLO3 : Analyse the thermodynamic aspects of chemical and physical processes to predict the spontaneity of processes and calculate the overall heat and work transfer.	<ul style="list-style-type: none"><li>• Weekly threshold quizzes</li><li>• Laboratory work</li><li>• In-term tests</li><li>• Final examination</li></ul>
CLO4 : Describe the principles of chemical equilibrium and apply this to phase behaviour and to chemical reactions.	<ul style="list-style-type: none"><li>• Weekly threshold quizzes</li><li>• Laboratory work</li><li>• In-term tests</li><li>• Final examination</li></ul>
CLO5 : Work safely in a laboratory to manipulate apparatus, perform quantitative and qualitative chemical analysis, evaluate the accuracy and precision of measurements, and to interpret results and observations.	<ul style="list-style-type: none"><li>• Laboratory work</li><li>• Final examination</li></ul>
CLO6 : Report the results of experiments by evaluating data and clearly communicating activities and findings.	<ul style="list-style-type: none"><li>• Laboratory work</li><li>• Final examination</li></ul>

# Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

## Assessments

### Assessment Structure

Assessment Item	Weight	Relevant Dates
Weekly threshold quizzes Assessment Format: Individual	8%	Start Date: Not Applicable Due Date: Not Applicable
Laboratory work Assessment Format: Individual	20%	Start Date: Not Applicable
In-term tests Assessment Format: Individual	32%	Start Date: Not Applicable
Final examination Assessment Format: Individual	40%	Start Date: Not Applicable

### Assessment Details

#### Weekly threshold quizzes

##### Assessment Overview

Each of the 8 topics covered in the course are assessed with a threshold (pass level) quiz that typically consists of 10 multiple choice questions – each question corresponds to a threshold learning outcome covered in the online lesson.

These quizzes are designed as study aids for you to keep up with the course work each week and to give feedback that will help you to develop the threshold learning outcomes for that topic.

You will have 2 weeks and unlimited attempts to achieve at least one attempt with a 10/10 outcome. Once this outcome is recorded you will be awarded a 1% course mark for that quiz. This totals 8% course marks across the term for all threshold quizzes

You will receive feedback immediately after each quiz attempt that allows you to review the questions answered incorrectly and explains why your chosen answer was incorrect.

##### Course Learning Outcomes

- CLO1 : Describe atomic, molecular and intermolecular structures using fundamental theory and apply this to chemical reactions including redox and acid/base reactions.
- CLO2 : Analyse reactions in batch and continuous processes and calculate the material and energy balances for the system based on the thermodynamic properties of fluids and solids.
- CLO3 : Analyse the thermodynamic aspects of chemical and physical processes to predict

- the spontaneity of processes and calculate the overall heat and work transfer.
- CLO4 : Describe the principles of chemical equilibrium and apply this to phase behaviour and to chemical reactions.

#### Assignment submission Turnitin type

Not Applicable

## Laboratory work

#### Assessment Overview

The laboratory classes are designed to provide you with practical experience in the lab as well as developing your observational and data analysis skills. You will be provided with feedback on your progress from your demonstrator during lab classes as well as through a personalized feedback web page that allows you to track and visualise your skill development.

You are required to attend a minimum of 6/8 laboratory classes and obtain ALL the core skills to meet the hurdle pass requirement for this course.

Laboratory work is assessed in two parts:

**Core skills:** You are required to achieve ALL core skills as a hurdle requirement to pass this course. You will be given multiple opportunities across several lab classes to demonstrate each core skill. Your demonstrator will communicate with you when you have been marked as competent for a given skill. Once you have achieved all the core skills required in the lab you will be awarded 10% course marks.

**Non-core skills:** Each of the 8 laboratory exercises will require you to complete questions in your lab book relating to the non-core skills listed for that lab. You will submit at the end of the lab class for marking by your demonstrator. The grades for these are tracked on your personalized feedback page and will total 10% course marks across the 8 laboratory classes.

#### Course Learning Outcomes

- CLO1 : Describe atomic, molecular and intermolecular structures using fundamental theory and apply this to chemical reactions including redox and acid/base reactions.
- CLO2 : Analyse reactions in batch and continuous processes and calculate the material and energy balances for the system based on the thermodynamic properties of fluids and solids.
- CLO3 : Analyse the thermodynamic aspects of chemical and physical processes to predict the spontaneity of processes and calculate the overall heat and work transfer.
- CLO4 : Describe the principles of chemical equilibrium and apply this to phase behaviour and to chemical reactions.
- CLO5 : Work safely in a laboratory to manipulate apparatus, perform quantitative and

qualitative chemical analysis, evaluate the accuracy and precision of measurements, and to interpret results and observations.

- CLO6 : Report the results of experiments by evaluating data and clearly communicating activities and findings.

### **Hurdle rules**

Achieve all core skills

Attend 6/8 lab classes

### **In-term tests**

#### **Assessment Overview**

There are two in-term tests each worth up to 16% of the course marks. In-term test 1 is in week 5 and assesses threshold topics 1-4. In-term test 2 is in week 9 and assesses threshold topics 1-8 (up to and including the final topic, electrochemistry).

The in-term tests are designed as a summative validation of your learning of the threshold concepts covered in each of the online lessons. Each test is typically 20 multiple choice questions, and these are drawn from the same question bank as the weekly threshold quizzes.

The threshold mark for each in-session test is 15/20. You must achieve the threshold mark or higher to be awarded course marks for this assessment. You will receive feedback within a few days of the test, and this will outline the questions answered incorrectly and link these to the threshold learning outcome they were assessing.

There will be multiple opportunities to re-sit the test in subsequent weeks if you do not achieve the threshold mark in earlier sittings. The deadline for achieving the threshold mark for test one is the end of week 7 and for test two it is the end of week 10.

You will need to pass at least ONE in-term test to pass the course.

### **Course Learning Outcomes**

- CLO1 : Describe atomic, molecular and intermolecular structures using fundamental theory and apply this to chemical reactions including redox and acid/base reactions.
- CLO2 : Analyse reactions in batch and continuous processes and calculate the material and energy balances for the system based on the thermodynamic properties of fluids and solids.
- CLO3 : Analyse the thermodynamic aspects of chemical and physical processes to predict the spontaneity of processes and calculate the overall heat and work transfer.
- CLO4 : Describe the principles of chemical equilibrium and apply this to phase behaviour and to chemical reactions.

### Detailed Assessment Description

These tests have been set at a **THRESHOLD** level of difficulty (course pass level). The hurdle mark for these quizzes is 15/20. If you do not achieve the hurdle mark of 15/20 or higher before the test deadline you will score 0 course marks for that assessment task.

Each test will consist of 20 multiple choice questions. If you score between 15-20 on this test, then this will be the grade you receive for that test. e.g a mark of 18/20 = 90% = 14.4/16 course marks.

If you do not achieve the pass minimum of 15/20 in the first sitting, then you will be offered additional opportunities to sit the test to achieve the 15/20 pass mark. However, the maximum available grade for these additional sittings will be capped at 15/20 (75%) which is equivalent to a maximum of 12 (out of 16) course marks for each test. Please note that multiple additional opportunities will be offered but we make no guarantee that you will be able to attend all of the additional sittings.

### In term test completion deadlines

- In term test 1 – 5 pm Friday week 7
- In term test 2 – 5 pm Friday week 10

Other important things to note about tests:

- Information about how in-term tests are conducted is provided in the in-term Tests section on Moodle. You need to read this information because it explains when your tests will occur, what materials you may and may not have with you during your test, our expectations of what you may and may not do during the test, and tips on how to prepare your environment before the test.
- If you do not sit the in-term tests on the first sitting offered and do not have special consideration, then the maximum available grade available to you in subsequent sitting will be capped at 15/20 for that test.
- We do not guarantee that you will have access to the theoretical maximum number of additional sittings of the tests. Special consideration for additional opportunities will only be granted in cases where circumstances have prevented you from attending all sittings offered.

### Hurdle rules

The threshold mark for each in-session test is 15/20. You must achieve the threshold mark or higher to be awarded course marks for this assessment.

You will need to pass at least ONE in-term test to pass the course.

# Final examination

## Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all Mastery topics covered in the course, including material from lectures, tutorials and labs. The exam is typically 2hrs 10 minutes and consists of MCQ, short numerical and written answer responses - details will be confirmed during the course.

The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

## Course Learning Outcomes

- CLO1 : Describe atomic, molecular and intermolecular structures using fundamental theory and apply this to chemical reactions including redox and acid/base reactions.
- CLO2 : Analyse reactions in batch and continuous processes and calculate the material and energy balances for the system based on the thermodynamic properties of fluids and solids.
- CLO3 : Analyse the thermodynamic aspects of chemical and physical processes to predict the spontaneity of processes and calculate the overall heat and work transfer.
- CLO4 : Describe the principles of chemical equilibrium and apply this to phase behaviour and to chemical reactions.
- CLO5 : Work safely in a laboratory to manipulate apparatus, perform quantitative and qualitative chemical analysis, evaluate the accuracy and precision of measurements, and to interpret results and observations.
- CLO6 : Report the results of experiments by evaluating data and clearly communicating activities and findings.

# General Assessment Information

## Grading Basis

Standard

## Requirements to pass course

You must score at least 15/20 in each In-Term test before the deadline to be eligible for marks for these assessments.

You must pass at least one of the In-Term tests to pass the course.

You must attend at least 6 laboratory classes.

You must be awarded all core laboratory skills (see laboratory manual for more details).

You must achieve a course mark of at least 50

# Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Introduction to the course Topic 1: Electronic structure of atoms
	Laboratory	See Lab Manual for details
	Tutorial	Introduction to Problem Solving
	Online Activity	Pre-lecture quiz: Electronic Structure of Atoms
Week 2 : 19 February - 25 February	Lecture	Topic 2: Periodic Properties of the Elements
	Laboratory	See Lab Manual for details
	Tutorial	Electronic Structure of Atoms
	Online Activity	Periodic Properties of the Elements
Week 3 : 26 February - 3 March	Laboratory	See Lab Manual for details
	Lecture	Topic 3: Bonding and Molecular Geometry
	Tutorial	Periodicity of Atomic Properties
	Online Activity	Pre-lecture quiz: Bonding and Molecular Geometry
Week 4 : 4 March - 10 March	Laboratory	See Lab Manual for details
	Lecture	Topic 4: Intermolecular forces and solution properties
	Tutorial	Bonding and Molecular Structure
	Online Activity	Pre-lecture quiz: Intermolecular forces
Week 5 : 11 March - 17 March	Laboratory	See Lab Manual for details
	Lecture	Topic 5: Chemical Equilibrium
	Tutorial	Intermolecular Forces
	Online Activity	Pre-lecture quiz: Chemical Equilibrium
	Assessment	In-term test 1 - first sitting
Week 6 : 18 March - 24 March	Laboratory	Make-up labs available if required - see Lab Manual for details
Week 7 : 25 March - 31 March	Laboratory	See Lab Manual for details
	Lecture	Topic 6: Acids/bases and equilibrium
	Tutorial	Equilibrium
	Online Activity	Pre-lecture quiz: Acids/bases
Week 8 : 1 April - 7 April	Laboratory	See Lab Manual for details
	Lecture	Topic 7: Thermochemistry
	Tutorial	Acids, Bases and pH
	Online Activity	Pre-lecture quiz: Thermochemistry
Week 9 : 8 April - 14 April	Laboratory	See Lab Manual for details
	Lecture	Topic 8: Electrochemistry
	Tutorial	Thermochemistry
	Online Activity	Pre-lecture quiz: Electrochemistry
Week 10 : 15 April - 21 April	Laboratory	See Lab Manual for details
	Lecture	Topic 9: Capstone Workshops
	Tutorial	Electrochemistry
	Assessment	In-term test 2 - first sitting

## Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

## General Schedule Information

Printable PDF course schedule with details of timing and content available on Moodle

# Course Resources

## Prescribed Resources

Textbook:

Brown, T., LeMay, H., Bursten, B., Murphy, C., Woodward, P., Langford, S., Sagatys, D. S., George, A. (2014). *Chemistry : The Central Science*, 3rd edition. Frenchs Forest, New South Wales: Pearson Australia.

## Recommended Resources

Databook:

Aylward, H. and Findlay, T.J.V., *SI Chemical Data*, (6th ed.), Wiley, 2008 (or later).

## Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Graham Ball					Yes	Yes
Administrator	Trinah De Leon			+612 9385 4651		Yes	No
Lab director	Ron Haines					No	No
Lecturer	Stuart Prescott					No	No
	Siobhan Wills					No	No

## Other Useful Information

### Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the [UNSW Student Code of Conduct Website](#).

## Academic Honesty and Plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The [Current Students site](#),
- The [ELISE training site](#), and
- The [Use of AI for assessments](#) site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>

## Submission of Assessment Tasks

### Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

*Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.*

Students are expected to manage their time to meet deadlines and to request extensions as

early as possible before the deadline.

## Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: <https://student.unsw.edu.au/special-consideration>

**Important note:** UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

## Faculty-specific Information

### Additional support for students

- [The Current Students Gateway](#)
- [Student Support](#)
- [Academic Skills and Support](#)
- [Student Wellbeing, Health and Safety](#)
- [Equitable Learning Services](#)
- [UNSW IT Service Centre](#)
- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)

### School-specific Information

#### UNSW Changes to Special Consideration: Short Extension

The School of Chemistry has carefully reviewed all of its assessments to determine whether they are suitable for automatic short extensions as set out by the UNSW Short Extension Policy. The

current deadline structures for all assessment tasks in the School of Chemistry already accommodate the possibility of unexpected circumstances that may lead students to require additional time for submission. **The School of Chemistry has opted out of the UNSW Short Extension provision for all its courses**, and we have already integrated flexibility into our assessment deadlines. This decision is subject to revision in response to the introduction of new course offerings. All students may still apply for Special Consideration for any assessment via the usual procedures.

## School Contact Information

Level 1, Dalton Building (F12)

W: [www.chemistry.unsw.edu.au](http://www.chemistry.unsw.edu.au)

Also see: **Contacts and Support** section of the course Moodle page (where applicable)