School of Chemical Engineering

UNSW Engineering

# CEIC2007

Chemical Engineering Lab A

Term 3, 2022

# Course Overview

## Staff Contact Details

### Convenors

| Name | Email | Availability | Location | Phone |
|---|---|---|---|---|
| Pierre Le-Clech | p.le-clech@unsw.edu.au | by appointment | 521 Hilmer building (entry through SEB) | 0293855762 |
| Graeme Bushell | g.bushell@unsw.edu.au | by appointment | 219 Hilmer (entry through SEB) | 0293855921 |

## School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see the Nucleus: Student Hub. They are located inside the Library – first right as you enter the main library entrance. You can also contact them via http://unsw.to/webforms or reserve a place in the face-to-face queue using the UniVerse app.

If circumstances outside your control impact on submitting assessments, Special Consideration may be granted, usually in the form of an extension or a supplementary assessment. Applications for Special Consideration must be submitted online.

For course administration matters, please contact the Course Coordinator.

# Course Details

## Units of Credit 6

## Summary of the Course

This course is designed to consolidate your understanding of basic principles in chemical engineering and develop your skills in planning, experimental technique including data acquisition, and analysis. Working in teams of 2, you will be assigned a range of experiments to complete during the term. You will develop your writing, presentation and critical analytical skills through marking feedback meetings organised with the academic in charge of each experiment.

## Course Aims

The course aims to reinforce basic concepts in chemical engineering and develop report writing and practical laboratory skills. In particular, CEIC2007 is intended to improve your ability to prepare, organise and carry out experimental work and analyse data. The laboratory experiments provide added experience in practical laboratory skills, teamwork, technical communications and project management. Theoretical concepts in chemical engineering will be reinforced by experience with experimental apparatus. You are expected to work at a more sophisticated level in terms of data analysis and interpretation in your laboratory reports.  This course will provide more varied types of technical communications compared to previous laboratory courses.

## Course Learning Outcomes

After successfully completing this course, you should be able to:

| Learning Outcome | EA Stage 1 Competencies |
|---|---|
| 1. Recognise the importance of planning and collaborative work, and collegial support | PE3.6 |
| 2. Define and evaluate risks and management strategies in the context of conducting experimental investigations of chemical engineering principles | PE2.2 |
| 3. Apply chemical engineering knowledge in the context of conducting experimental investigations including data acquisition | PE2.1 |
| 4. Prepare written laboratory reports and deliver effective oral presentations that clearly communicate experimental results, analysis and relationship to theory | PE3.2 |
| 5. Analyse data to identify the source and significance of experimental uncertainties and learn the ethical responsibilities that comes with acquiring, handling and reporting data | PE1.2 |
| 6. Integrate knowledge to handle uncertainty in conducting chemical engineering experiments | PE1.4 |

**Relationship with the discipline and the rest of your program**

A key part of the professional practice of chemical engineering is your ability to investigate problems. Sometimes these investigations occur on the desktop (e.g. researching design options, simulating processes or developing techno-economic models). Other investigations involve the collection and analysis of data from natural phenomena, equipment or product testing, or process operations.

Experimental practice and inquiry-based learning can be thought of as a spectrum from highly constrained confirmation-level inquiry (essentially a demonstration) through to the largely unconstrained open-level inquiry. The change across this spectrum is the degree to which you design the inquiry.

In CEIC2007, you will be conducting experiments (mostly designed by the lecturers) and analysing your results to address the aims/objectives of the project. In this way, CEIC2007 builds on the experimental and data analysis skills you developed in your first-year science courses. You will be asked to complete 4 experiments in series “A” (i.e. quite simple, with a fair amount of directions given), and 3 experiments in series “B” (with more to be completed in the lab, more to be analysed and discussed in longer reports, and more opportunities for you to decide what to do). The skills in experimental design and practice you develop in this course will be employed and extended in CEIC3007 and in your final year thesis project.

This course also provides practical experience with the technologies studied from a theoretical and design perspective in other courses. For example, some of the experiments involve a refrigeration system which you have studied the principles of operation in CEIC2000.

## Teaching Strategies

Student learning will be supported through online pre-reading for each experiment, including links to relevant theory from pre-requisite courses. Each student will need to pass an online test prior to commencing each experiment. This is intended to promote a level of planning and preparation, as is the requirement to book the academic supervisor of the experiment for a "live" marking session of the submitted assessments including immediate feedback, commentary and discussion.

## Additional Course Information

### Expectations of students

This course consists of 27 hr of class contact hours (9 x 3 hr). You are expected to take an additional 120 hr of non-class contact hours to complete lab preparation, readings and assessments.

Integrity and Respect:

The UNSW Student Code of Conduct (https://student.unsw.edu.au/conduct) among other things, expects you to demonstrate integrity in all your academic work and to treat all staff, students and visitors to the University with courtesy, tolerance and respect.

Time commitment:

UNSW expects you to spend approximately 150 hr to successfully complete a 6 UOC course like CEIC2007. Learning about the principles and the operation of a new rig will require your team to carefully plan, to execute laboratory work over 3-hr lab sessions in consecutive weeks. Therefore, you are expected to spend significant time (11–13 hr per week) outside of class working through provided preparation materials, reviewing background material, preparing your experimental plan, reviewing results and writing reports.

Competence:

You are expected to enter CEIC2007 having developed competencies in all the material covered in the assumed knowledge courses, at least. In addition, this course will draw on skills and content from other second year courses. Over the course of the term, you will be developing new competencies. To illustrate the standards we expect, marking rubrics or guidelines will be provided for all assessments. The teaching staff will apply these marking guides fairly and provide you with feedback so you can continue to improve over the term and beyond.

Participation:

To complete the experimental projects, you are required to work in a team. We expect all team members to agree on how they will manage the team (e.g. making and documenting decisions), to assign the project work equitably and contribute to the delivery of project outputs to the best of their ability. In the laboratory, you are expected to make productive use of your time, conducting their experiments in a way that does not injure anyone and does not damage the equipment.

Following your experimental work, you will finish analysing your results and prepare a report and/or presentation. You are expected to contribute to online discussions (on Teams). You are expected to read all the discussion posts and announcement on moodle. You may wish to discuss challenges faced through this course, ask questions about course content, discuss solutions to problems encountered. It is expected that you will help each other, and the lecturers will contribute as required.

Attendance and punctuality:

We expect you to be punctual and attend at all experimental and ‘marking’ sessions. University commitments take precedence over regular work activities, holidays etc.

**Presumed knowledge and relationships to other courses**

Most relevant presumed knowledge involved:

- CEIC2000 - Material and Energy Systems
- CEIC2001 - Fluid and Particle Mechanics
- CEIC2002 - Heat and Mass Transfer

You are also assumed to have working knowledge of second year undergraduate statistics, experimental techniques and use of MS Excel. This course is used to prepare you for higher-level lab courses (CEIC3007), which involve group work (CEIC4001), or research projects (CEIC4951, CEIC4952, CEIC4953 or CEIC4007, CEIC4008).

# Assessment

**In summary:**

7 interviews x 6 marks = 42 marks

3 short reports (A#1 – A#3) x 5 marks = 15 marks

1 presentation (A#4 in week 5) = 7 marks

3 longer reports (B#1 – B#3) x 12 marks = 36 marks

**To comfortably succeed this course, you are strongly encouraged to follow the following steps.**

**1. Before entry to the lab:**

Successful completion of online pre-lab lesson (30-40 min) is required prior to each experiment. A completion certificate (Moodle screen-shot or printed document – on which your name is visible) will be asked for before you can access the rig. On completion, you will have access to the "Quick Guide" document, containing additional information about the experiment and the safe and correct operation of the rig. These lessons will not be marked but completion is required to release course materials that you will need for each experiment.

**2. Before conducting the experiments:**

A pre-lab interview will be conducted to assess your level of understanding of the rig, its operation and the risk associated with it, along with your preparedness for conducting an experiment targeting the main objectives of the day. (See typical questions in the marking criteria).

**3. On completion of the experiments (before leaving the lab):**

A post-lab interview will be also conducted before you can leave the lab. You will have to make yourself available at least 20 min before the end of the session to answer a couple of questions from the tutor. (See typical questions in the marking criteria).

**4. At home:**

Write the reports or prepare your presentation in team. Short reports (and a short presentation) are required for the first 4 experiments, while long reports (and a long presentation) will be needed for the last 3 experiments. Check the detailed schedule on Moodle.

*Important notes:*

Reports are due for submission on Moodle 6 days after your lab visit at 9.00pm (i.e. if your lab visit is Wednesday, your report is due the following Tuesday at 9.00pm).

All laboratory reports must be pre-processed through Turnitin prior to upload (see instructions on

moodle). Only one of your team members has access to and responsibility to use the Turnitin tool for the team. Submissions not processed through Turnitin will not be accepted, and will be eligible for a late penalty.

All late submissions will be penalised at 20% per day, pro rata.

| Assessment task | Weight | Due Date | Course Learning Outcomes Assessed |
|---|---|---|---|
| 1. Pre and Post-Lab Interviews | 42% | See above | 1, 2, 3, 4, 5, 6 |
| 2. Lab Report and Presentations | 58% | See above | 1, 2, 3, 4, 5, 6 |

## Assessment 1: Pre and Post-Lab Interviews

**Due date:** See above

A satisfactory performance in the individual pre-lab interview is required before students can undertake the laboratory experiment. In particular, the tutor needs to assess that you understand the risk associated with the operation of the rig. Completion of online preparation modules including quizzes, and revision as necessay. Individual completion. Immediate feedback online.

All 7 experiments will feature pre- and post-lab interviews (6 marks each).

**Assessment criteria**

See marking rubrics on Moodle

## Assessment 2: Lab Report and Presentations

**Due date:** See above

In the first part of the term (Weeks 1 to 4), only short reports will be required (5 marks each, team allocation, peer-assessment needed). Emphasis will be on data introduction and presentation, with opportunity for D and HD marks for students incorporating discussion in the report. On week 5, students will be presenting their result in a 15 min long presentation (7 marks, allocated individually). As students will be asked to conduct more advanced experiments from week 7, a higher level of reporting will also be expected. The three resulting reports will have a maximum mark of 12 (team allocation, peer-assessment needed). In particular, the students will be required to demonstrate their understanding of the fundamental principles of the experienced process to explain the results and trends obtained in the lab.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

## Attendance Requirements

Given the nature of the course, students are required to be in the lab to conduct the experiments.

## Course Schedule

The typical schedule is provided here, but dates and times are subject to change depending on class progress and unforeseen occurrences. Any changes will be posted on Moodle in the announcement forum. **You must read all posts in the announcement forum**.

Laboratory Experiments will be detailed in separated laboratory guidelines and posted on Moodle. Due to constraints of laboratory allocations, changes between laboratory slots will not be possible.

Group allocations will be posted on Moodle. Note that the laboratory experiments will be carried out in the Chemical Engineering Teaching Laboratories (Level 1, Building E8).

View class timetable

### Timetable

| Date | Type | Content |
|---|---|---|
| O-Week: 5 September - 9 September | Homework | Be sure to read course outlines, register a team of 2 students, complete compulsory lab induction. All details given on Moodle. |
| Week 1: 12 September - 16 September | Seminar | Welcome and introduction to course |
| | Experiment | A#1 |
| Week 2: 19 September - 23 September | Experiment | A#2 |
| | Assessment | Report on Experiment A#1 |
| Week 3: 26 September - 30 September | Experiment | A#3 |
| | Assessment | Report on Experiment A#2 |
| Week 4: 3 October - 7 October | Experiment | A#4 |
| | Assessment | Report on Experiment A#3 |
| Week 5: 10 October - 14 October | Presentation | Presentation on experiment A#4 |
| Week 6: 17 October - 21 October | | Flexibility week |
| Week 7: 24 October - 28 October | Experiment | B#1 |
| Week 8: 31 October - 4 November | Experiment | B#2 |
| | Assessment | Report on Experiment B#1 |

| | | |
|---|---|---|
| Week 9: 7 November - 11 November | Experiment | B#3 |
| | Assessment | Report on Experiment B#2 |
| Week 10: 14 November - 18 November | Experiment | Catchup experiment only if any missed during the term.<br><br>Also opportunity to repeat and/or expand some of the tasks from Experiment B#3. |
| Study Week: 21 November - 24 November | Assessment | Report on Experiment B#3 |

# Resources

## Recommended Resources

Laboratory Guidelines, some reference materials and schedule will be posted on Moodle.

D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, “Fundamentals of Analytical Chemistry”, 8th Ed, 2004, Thompson Learning-Brooks/Cole, Belmont CA, USA.

D.A. Skoog, F.J. Holler and S.R. Crouch, “Principles of Instrumental Analysis”, 6th Ed, 2007, Thompson Learning-Brooks/Cole, Belmont CA, USA.

Students seeking additional materials can obtain assistance from the UNSW Library. One starting point is info.library.unsw.edu.au/services/services.html

## Laboratory Workshop Information

Feedback is gathered periodically using by various means, including through myExperience Process.

Changes since the course last ran:

| Change | Need for change | Identified from |
|---|---|---|
| More difficult experiments kept for the second half of the course | Students struggling with overcomplicated rigs in early stage | Students and staff |
| Revision of materials for online blocks | Better lining-up and relevance with the activities conducted in the lab | Students and staff |

## Submission of Assessment Tasks

In the School of Chemical Engineering, all written work will be submitted for assessment via Moodle unless otherwise specified. Attaching cover sheets to uploaded work is generally not required; when you submit work through Moodle for assessment you are agreeing to uphold the Student Code.

Some assessments will require you to complete the work online and it may be difficult for the course coordinator to intervene in the system after the due date. You should ensure that you are familiar with assessment systems well before the due date. If you do this, you will have time to get assistance before the assessment closes.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

### Late penalties

Unless otherwise specified, submissions received after the due date and time will be penalised at a rate of 5% per day or part thereof (including weekends). For some activities including Moodle quizzes and Team Evaluation surveys, extensions and late submissions are not possible.

### Special consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW has a Fit to Sit / Submit rule, which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

**Note:** UNSW does not require a medical certificate for COVID-related absences of 7 days or less, however you must provide formal evidence from your local/state health provider (e.g. NSW Health) that clearly states your name and the date you tested positive (i.e. confirmation of your RAT registration, PCR test result). Longer absences due to extended self-isolation or COVID-related illness will still need documentation such as a medical certificate.

Applications for special consideration **will still be required** for assessment and participation absences related to COVID-19. Special consideration requests should not be lodged for missing classes if there are no assessment activities in that class.

## Academic Honesty and Plagiarism

**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 (International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013). 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 and plagiarism can be located at:

- The Current Students site
- The ELISE training site

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

**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.

For assessments in the School of Chemical Engineering, we recommend the use of referencing software such as Mendeley or EndNote for managing references and citations. Unless required otherwise specified (i.e. in the assignment instructions) students in the School of Chemical Engineering should use either the APA 7th edition, or the American Chemical Society (ACS) referencing style as canonical author-date and numbered styles respectively.

# Academic Information

To help you plan your degree, assistance is available from academic advisors in The Nucleus and also in the School of Chemical Engineering.

## Additional support for students

- Current Student Gateway
- Engineering Current Student Resources
- Student Support and Success
- Academic Skills
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- IT Service Centre

## Course workload

Course workload is calculated using the Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

## On-campus class attendance

Physical distancing recommendations must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. Class rosters will be attached to corresponding rooms and circulated among lab demonstrators and tutors. No over-enrolment is allowed in face-to-face class. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1.

In certain classroom and laboratory situations where physical distancing cannot be maintained or the staff running the session believe that it will not be maintained, face masks will be designated by the course coordinator as **mandatory PPE** for students and staff. Students are required to bring and use their own face mask. Mask can be purchased from IGA Supermarket (Map B8, Lower Campus), campus pharmacy (Map F14, Middle Campus), the post office (Map F22, Upper Campus) and a vending machine in the foyer of the Biological Sciences Building (Map E26, Upper Campus).

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW health or government authorities. Current alerts and advice can be found here. Do not come to campus if you have any of the following symptoms: fever (37.5 °C or higher), cough, sore throat, shortness of breath (difficulty breathing), runny nose, loss of taste, or loss of smell. If you need to have a COVID-19 test, you must not come to campus and remain in self-isolation until you receive the results of your test.

**You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-**

**isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.
For more information, please refer to the FAQs: https://www.covid-19.unsw.edu.au/safe-return-campus-faqs

*Note: This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.*

## Image Credit

Dr Peter Wich

## CRICOS

CRICOS Provider Code: 00098G

## Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

## Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

| **Program Intended Learning Outcomes** | |
|---|---|
| Knowledge and skill base | |
| PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline | |
| PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline | ✓ |
| PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline | |
| PE1.4 Discernment of knowledge development and research directions within the engineering discipline | ✓ |
| PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline | |
| PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline | |
| Engineering application ability | |
| PE2.1 Application of established engineering methods to complex engineering problem solving | ✓ |
| PE2.2 Fluent application of engineering techniques, tools and resources | ✓ |
| PE2.3 Application of systematic engineering synthesis and design processes | |
| PE2.4 Application of systematic approaches to the conduct and management of engineering projects | |
| Professional and personal attributes | |
| PE3.1 Ethical conduct and professional accountability | |
| PE3.2 Effective oral and written communication in professional and lay domains | ✓ |
| PE3.3 Creative, innovative and pro-active demeanour | |
| PE3.4 Professional use and management of information | |
| PE3.5 Orderly management of self, and professional conduct | |
| PE3.6 Effective team membership and team leadership | ✓ |