School of Chemical Engineering

UNSW Engineering

CEIC3007

Chemical Engineering Lab B

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Dr Peter Neal	peter.neal@unsw.edu.au	For confidential matters, please contact via Teams chat or call.	Hilmer (E10) 216	

Lecturers

Name	Email	Availability	Location	Phone
Dr Graeme Bushell	g.bushell@unsw.edu.au	For confidential matters, please contact via Teams chat or call.	Hilmer (E10) 219	
Dr Sarah Grundy	s.grundy@unsw.edu.au	For confidential matters, please contact via Teams chat or call.	SEB (E8) 433	

Demonstrators

Name	Email	Availability	Location	Phone
Mr James Morel	j.morel@unsw.edu.au	During scheduled classes only.		
Prof. Guangzhao Mao	guangzhao.mao@unsw.edu.au	During scheduled classes only.		
Mr Koentadi Hadinoto	k.hadinoto@unsw.edu.au	During scheduled classes only.		
Mr Jun Wen Tang	jun.tang@unsw.edu.au	During scheduled classes only.		
Ms Maggie Lim	maggie.lim@unsw.edu.au	During scheduled classes only.		

Lab Staff

Name	Email	Availability	Location	Phone
Mr Andrew Chau	h.chau@unsw.edu.au	During scheduled lab classes only.		

School Contact Information

Enquiries related to the course (e.g. course content, assessment instructions) should be raised during the scheduled classes, office hours, or in Teams channels/Moodle forums designated for that purpose.

Learning and question etiquette:

- Please be prepared for classes and attend the timetabled classes so that you can ask questions during the class time.
- Please respect that demonstrators and tutors have scheduled the class time to help you learn and are likely to be busy with other responsibilities outside those times; questions asked outside of class times will take longer to be answered.
- PhD students and other casuals who are teaching classes are normally only expected to look after the timetabled class and not to provide follow-up one-on-one assistance.
- Please don't ask questions in private that could be reasonably asked in a way that everyone can learn from the discussion.
- As a member of a community of learners, please try answering each other's questions!
- Please limit private messages to staff (via email or Teams) to *confidential* matters related to course administration.

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.

Course Details

Units of Credit 6

Summary of the Course

A key part of the professional practice of chemical engineering is the 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. As professional chemical engineers you will be called upon to lead, plan and execute engineering projects investigating opportunities for process development and improvement. It's our bread and butter.

In this course you will develop and extend your skills in designing and executing experimental investigations of chemical engineering problems using small pilot-scale unit operations and analytical equipment. You will work in a team to conduct and document three experimental projects. Each team in your class will complete a different set of projects; however, they are all designed to achieve the same learning outcomes. The experimental projects in this course have an open-ended nature and will require you to plan and execute laboratory work over one or two lab sessions in consecutive weeks.

This course will further develop your skills in analysis, critical thinking, communication, project management and teamwork. This will be achieved through preparing and presenting an experimental proposal, collaborating in laboratory environment to execute your plan, and documenting and reflecting on your results in a technical report. Direct feedback will be provided the demonstrator in charge of your experimental project, with additional feedback and grades provided online. The course concludes with a seminar where each team will reflect on their learning over the term.

Course Aims

This course aims to:

- Develop your ability to design and execute experimental investigations in accordance with applicable safety and ethical standards, and
- Develop students' professional skills in analysis, critical thinking, communication and teamwork.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Integrate and apply knowledge of mass and energy balances, transport phenomena, thermodynamics, statistics, unit operations, and process control to plan, conduct and interpret guided experimental enquiries.	PE1.2, PE1.3, PE1.4, PE1.6, PE2.1, PE2.2, PE2.4
2. Apply the principles of process safety and WHS to identify and manage risks in laboratory operations.	PE1.3, PE1.6, PE2.1, PE2.2, PE3.1
3. Demonstrate academic and research integrity in the preparation, conduct, analysis and reporting of experiments,	PE2.1, PE3.1, PE3.4

Learning Outcome	EA Stage 1 Competencies
including data management.	
4. Combine the knowledge and skills of peers in the effective design, execution and management of team-based experimental projects.	PE1.5, PE1.6, PE2.4, PE3.6
5. Reflect on experiential learning in the context of chemical engineering practice.	PE1.5, PE3.3, PE3.5
6. Effectively communicate the background, planning, analysis and interpretation of experiments in written and oral forms.	PE3.2, PE3.4

Pre-requisite courses and assumed knowledge

This course builds on content you studied in other courses within the chemical engineering specialisation, in particular the following pre-requisite courses

- CEIC2007 – experience of conducting structured experimental enquiries,
- CEIC3001 – particularly, the content on separation processes,
- CEIC3005 – everything, except process economics, and
- MATH2089 – statistics.

In addition, you are expected to be studying or have studied

- CEIC3006 – your third experiment will involve some aspects of process control.

Relationship with the discipline and the rest of your program

A key part of the professional practice of chemical engineering is the 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. CEIC3007 builds on the experimental and data analysis skills you developed in your first-year science courses and in CEIC2007. This course also builds on your teamwork, project management and communication skills developed in your design courses.

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 distillation column for which you have studied the principles of operation in CEIC3001 and will study the design of in CEIC3004. There will also be opportunity to compare the performance of a real-world unit with the predictions of a process model or simulation, as you developed in CEIC3000 and CEIC3005. Finally, the final experiment in the course will give you some practical experience of process dynamics and control and will apply some of your early learning in CEIC3006. This course also allows you to develop your professional skills in communication, teamwork and project management.

Teaching Strategies

This is an experiential, enquiry-based learning course structured around three experimental projects. The experiments are longer and more complex than those in CEIC2007. In this way, CEIC3007 builds on the experimental and data analysis skills you developed in your science and maths courses, and in CEIC2007. The skills in experimental design and practice you develop in this course will be employed and extended in your final year thesis project. This feeds into your professional practice as a chemical engineer where you will contribute to (and eventually lead) projects in process design, development and improvement, requiring a set of well-developed enquiry skills.

Rationale

Enquiry-based learning can be thought of as a spectrum (Banchi & Bell, 2008) from highly constrained demonstrations (or confirmation-level enquiries) through to the largely unconstrained projects like thesis or DP (or open-level enquiries). The change across this spectrum is the degree to which the student directs the enquiry. Thus in comparison to CEIC2007, CEIC3007 will require you to take more responsibility for the design of the experiments, and for analysing and interpreting your results to address the aim(s).

Further, enquiry-based activities move through several phases (Pedaste et al., 2015), namely Orientation, Conceptualisation, Investigation and Conclusion, as well as Discussion. To a certain extent, this framework is analogous to the five phases of classic project management theory (Orientation = Initiating, Conceptualisation = Planning, Investigation = Executing, Discussion = Monitoring and Controlling, and Conclusion = Closing). These phases and the teaching strategies in each of them are outlined below.

To maximise your experiential learning, we have structured this course around three experimental projects. Experiential learning can be thought of as a spiral (Passarelli & Kolb, 2012). It begins with Concrete Experience(s) by the self or others, which moves into Reflective Observation where you think about the experience and start asking questions, then comes Abstract Conceptualisation where you link your reflections with the learning of others (team mates, literature, industry practice) and construct interpretative theories of the experience, and finally Active Experimentation where you plan how to put your learning into practice and hypothesise about the outcomes of future concrete experiences.

The three experiments in CEIC3007 serve as three learning cycles where you can apply your learning about experimental investigation from one cycle in subsequent cycles. Then each experiment consists of multiple cycles – the orientation and conceptualisation phases are one cycle, and the investigation and conclusion phases another. At an even smaller level, the two multi-week experiments provide extra cycles within the investigation phase. At the other end of the scale, the whole course with it's introductory material, the three experiments and the final reflective seminar means that the entire course is also a learning cycle. And if each course is an experiential learning cycle, then your degree is also a learning cycle. It's learning cycle inception!

Orientation / Initiating

To prepare you for the safety and ethical demands of this course, we have an introductory quiz to confim you understand what it means to conduct experimental investigations in a safe manner, and in a way that demonstrates academic and research integrity.

For each experiment, we provide you with an online lesson to orient you to the experiment's aims, background theory and the apparatus. You will have an opportunity to be briefed by the lab manger on the safe and effective operation of the equipment you will be using. This will take place during your regular lab time, the week before your first session for that experiment.

Conceptualisation / Planning

To ensure you're ready for your lab sessions we expect you to complete online lessons and their associated quizzes, as well as preparing an experimental proposal and a risk management form. This preparation work will require you to perform a review of relevant literature to learn about the process you're investigating and the analytical techniques you will use. You will also need to think about how you will plan your experiment over one or two weeks. Your preparation will be verified by your demonstrator through listening to your proposal presentation and asking questions of each team member. Through this session they will also validate whether your proposed plan is likely to answer the experimental aim(s). You will receive feedback on how to improve your experimental plan and risk management.

Investigation / Executing

During your lab sessions you will execute your experimental plan. These sessions are designed to give you practical experiences in feed preparation, sample calibration, operating equipment, recording data and observations, and analysing samples. These sessions are also designed to give you experience of operating, controlling and improving the performance of unit operations of increasing complexity. In this way, we are preparing you for managing the operation of industrial scale unit operations.

Discussion / Monitoring and Controlling

During your lab session, your demonstrator will be available to answer questions and ensure compliance with safety expectations. They will also ask you questions to check your understanding, highlight interesting phenomena, and guide your through the experience.

Following your lab session, you will write either a team or individual report. The purpose of these reports is for you to practice the analysis and interpretation of real data, and consolidate your understanding of the experiment. The report also provides an opportunity for you to discuss outcomes and limitations of your experiments in a literature and industrial context.

Conclusion / Close

Each experimental project closes with you submitting your report. Your demonstrator will grade it and provide you with feedback during your regular lab time in the week after your final lab session for that experiment. This session will also be when you initate your next experimental project with a briefing on the next experiment's equipment.

At the end of semester is the seminar. This activity is designed to help you consolidate and reflect on your learning across the entire term. Drawing lessons from not just individual experiments but also looking at what you've learnt through all the different experiential learning cycles in this course, and engage in Active Experimentation - thinking about how you'll put what you've learnt into practice.

Additional Course Information

Integrity, Respect and Inclusion

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

Teams may include a member who is participating remotely for the first two experiments. Teams are expected to include this member in their lab experiences (preferably via live video streams) and in team discussions/meetings.

Time commitment

UNSW expects students to spend approximately 150 hours to successfully complete a 6 UOC course like CEIC3007. Completing the three experimental projects will require approximately 30-40 hours in-class contact hours. This time will be spent in inductions and briefings, presenting your experimental plan and progress updates to your demonstrator, as well as actually conducting the experiment and analysing samples. This leaves a significant portion of the course (110-120 hours or at least 10 hours per week) to be completed outside of class. You will spend this time working through provided preparation materials, reviewing background material they find, preparing your experimental plan, reviewing interim results and refining the experimental plan, writing up your findings in reports, and preparing for the final seminar. Students must attend their timetabled classes (seminars, presentations, labs and brief/debrief sessions). This course is not compatible with full-time work.

Competence

Students are expected to enter CEIC3007 having developed competencies in all the material covered in the pre-requisite courses, at least. In addition, this course will draw on skills and content from other third year courses. Little time is available to remediate any deficiencies in your knowledge of those topics. Over the course of the term, you will be developing new competencies and 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. Your contribution to the team will be peer evaluated throughout the course - the scores from these evaluations will be used to convert your team marks to individual marks.

In the laboratory, students are expected to make productive use of their time, conducting their experiments in a way that does not injure anyone and does not damage the equipment.

For two week experiments -

- After the first session working on a given problem, teams should process their initial results and refine their experimental plan for the following week.
- Following the second session, students will finish analysing their results and prepare a report and/or presentation.

Students are expected to contribute to online discussions through the course forum on Teams. You may wish to discuss challenges faced through this course, ask questions about course content, discuss solutions to problems encountered. It is expected that students will help each other, and the lecturers will contribute as required.

Attendance and punctuality

We expect students to be punctual and attend at all experimental and ‘marking’ sessions. University commitments take precedence over regular work activities, holidays etc. Students who attend less than 80% of their possible classes may be refused final assessment. If you miss a class, we expect you to catch up in your time, lectures will be recorded and made available through Moodle.

Assessment

Successful completion of online pre-lab quizzes, risk assessment and experimental planning are required prior to each of three experimental projects. This preparation work will require you to perform a review of relevant literature to learn about the process you're investigating and the analytical techniques you will use. You will also need to think about how you will plan your work out over one or two weeks (depending on the experiment). Finally, your team should conduct a qualitative risk assessment for the experiment and apparatus.

Before starting each experiment, teams will present an experimental plan using visual aids to a demonstrator and answer their questions. These presentations will be conducted online during the scheduled Seminar time as noted in the course schedule. Upon successfully completing this oral defence, your team can commence your experiment. Slides and completed Risk Management Form (HS017) will be submitted prior to the presentation.

The first experimental project will be carried out in one 3-hour laboratory sessions, while the second and third projects will be carried out over two 3-hour laboratory sessions in consecutive weeks. Each week you will begin by meeting with your demonstrator to discuss your reflection of the previous week (of preparation, or of experimentation and analysis). Before you leave each week, you will again meet with your demonstrator to debrief and discuss your plans for the following week.

Following the submission of your report, you will debrief with your demonstrator during your regular lab time (this may include discussing your report feedback). You will also have an opportunity to inspect the rig for the next experiment.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Introductory Quiz	5%	9am Monday, Week 2	2, 3
2. Experiment proposals	30%	9am Monday in Weeks 2, 4 and 8	1, 2, 3, 4, 6
3. Technical reports	45%	9pm two days before your regular lab session (e.g. Tuesday teams submit on Sunday) in Weeks 3, 7 and 10	1, 3, 4, 5, 6
4. Final Seminar	20%	During the exam period (slides are due at 9pm the night before).	1, 4, 5, 6

Assessment 1: Introductory Quiz

Submission notes: Submitted via a Moodle Quiz
Due date: 9am Monday, Week 2

Individual assessment of student's knowledge of academic and research integrity, as well as general and laboratory workplace health and safety.

Additional details

Complete online modules on Laboratory Safety Awareness and Working with Academic Integrity before attempting the quiz. You will need to provide evidence of completion of each course.

Successful completion of these modules is required prior to your being permitted to enter the lab.

Start early to allow the resolution of unexpected problems.

Assessment 2: Experiment proposals (Group)

Assessment length: 20 minutes
Submission notes: Submit your risk management form and presentation slides using the dedicated activities on Moodle.
Due date: 9am Monday in Weeks 2, 4 and 8

Students present and defend their proposed work plan to experiment demonstrator. Oral proposals and defence for three experiments at 10% each. Proposals are group assessed with the answering of questions assessed individually. Team mark is moderated by peer assessment.

Additional details

You will present your experimental proposal in a 20min session during the regular seminar timeslot (Monday 11am-1pm) in the week you commence each experiment. Please contact your demonstrator for that experiment to arrange the exact time.

The session will consist of your proposal presentation (max. 10min), followed by Q&A with your demonstrator.

See the assessment guide for more details including assessment criteria.

Assessment 3: Technical reports (Group)

Submission notes: Submit your report as a Word file through the Turnitin activity on Moodle.
Due date: 9pm two days before your regular lab session (e.g. Tuesday teams submit on Sunday) in Weeks 3, 7 and 10

Students will write a technical report documenting the results of their experimental investigations and interpreting their meaning (15% each). The first report will be a team submission, while the second and third reports will be individual submissions. The team report marks will be moderated by peer assessment.

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

Additional details

See the assessment guide for more details including assessment criteria.

Assessment 4: Final Seminar (Group)

Assessment length: 15-20 minute presentation, plus 10 minutes for questions
Submission notes: Submit your slides in activity on Moodle.
Due date: During the exam period (slides are due at 9pm the night before).

Students will give a team-based presentation reflecting on their learning over the course of the term in general, and each of their experiments. The presentation will be given to the rest of their class and their demonstrators. The presentation will be followed by Q&A with the audience.

Additional details

See the assessment guide for more details including assessment criteria.

Attendance Requirements

You must attend all proposal presentations, demonstrator meetings, experiment briefings, and lab classes. Except where students are enrolled in an online class, attendance at experiment briefings and lab classes must be in person.

If you are unable to attend for reasons beyond your control (e.g. sickness, madated isolation, misadventure), please apply for special consideration.

Course Schedule

Student teams

Many of the activities in this course are team-based (Experiment Proposals, laboratory sessions, the first Technical Report, and the Final Seminar). You should aim to select a team as soon as possible - look for the Team Selection section on the course Moodle page.

Some teams will consist of both on-campus and online students - even on-campus only teams may have team members that need to study online. It is critical for on-campus students to include their online teammates in all aspects of the course (team and demonstrator meetings, developing experimental plans, conducting experiments sessions, data analysis, preparing team assesments). On-campus students have the responsibility of being the "eyes and ears" of their online colleagues in the lab (using a digital devices with videoconferencing). Similarly, online students should complete tasks during lab sessions that can be managed remotely (e.g. recording and processing data, checking references and monitoring the experimental plan).

It is important that you engage constructively and consistently with the rest of your team, as team-based assessments may be moderated by peer assessment surveys. Effective team membership includes

- listening respectfuly and communicating constructively,
- being proactive and responsible in acheiving team purposes,
- being adaptable and building team cohesion,
- earning trust by completing assigned tasks on time and at or above the agreed quality, and
- being able to give and receive feedback in a constructive and non-protective manner.

Classes

The Monday Seminar will be used for the course launch lecture, proposal presentations and occasional office hours sessions. Times for proposal presentations should be arranged with your experiment demonstrator (see Moodle for details) within this period.

You should plan to attend campus on your lab day every week of term (except Week 6). In non-experiment weeks, you will have inductions, debriefs with your demonstrator, and briefings on upcoming experiments. Some experiments will also require one or two team members to attend the lab the following day to analyse your calibration and experimental samples. The only exceptions to this are (1) students who have received permission to study remotely and are enrolled in the dedicated online class, and (2) those who have been excused from attending through special consideration or equitable learning plans.

Teaching arrangements

Your learning in your lab class will be guided by one or more academic staff and two demonstrators, plus the lab manager. Please see the Course Overview section for contact details.

Class	Teaching staff
Tuesday 10am-1pm (on campus only)	Dr Graeme Bushell (lead), Mr Koentadi Hadinoto, Ms Maggie Lim
Wednesday 10am-1pm (on campus only)	Dr Sarah Grundy (lead), Mr James Morel, Mr Jun Wen Tang
Thursday 2-5pm (on campus + online*)	Dr Peter Neal (lead), Prof. Guangzhao Mao, Mr Koentadi Hadinoto, Ms Maggie Lim

* Online students will work with Mr Jun Wen Tang for their Rotation 3 experiment.

View class timetable

Timetable

Date	**Type**	**Content**
O-Week: 23 May - 27 May	Online Activity	• Read the course outline and put all the assessment deadlines in your calendar. • Complete the Lab Safety Awareness (HSELSO) and Working with Academic Integrity (WWAI) training modules. See Moodle for details. • Join a team (maximum 4 on-campus students per team).
Week 1: 30 May - 3 June	Seminar	• Introduction to the course (including how you'll learn and how the course is organised) • Overview of assessments • Opportunity to ask questions

	Tut-Lab	• Hour 1 - Meet in SEB 102 for your laboratory induction
		• Attend the lab to be briefed on your Rotation 1 experiment and the rig you will be using
		    ◦ Hour 2 - Distillation A
		    ◦ Hour 3 - Membrane A

	Assessment	• If not already done so, complete the Lab Safety Awareness (HSELSO) and Working with Academic Integrity (WWAI) training modules. • Complete the Introductory Quiz

	Homework	- Organise a time and location for your Rotation 1 Experiment Proposal presentation with your demonstrator. - Read through the Assesment Guide for Experiments - Complete the online lesson for your Rotation 1 experiment and any recommended reading or literature reviews - As a team, develop your experimental plan for acheiving the provided experimental objectives. - Conduct a qualitative risk analysis of your experiment and complete the standard Risk Management Form (HS017) - Prepare for your Experiment Proposal presentation.
Week 2: 6 June - 10 June	Seminar	- Meet your Rotation 1 demonstrator at the prearranged time and location. - Present your Rotation 1 Experiment Proposal to your demonstrator (maximum 10 minutes). - Answer your demonstrator's questions on your Experiment Proposal. - Discuss whether your Risk Management Form is satisfactory.
	Laboratory	Rotation 1 / Experiment A - Before the Lab - Carry out any changes or additional work recommended by your demonstrator - Prepare tables for collecting data - During the Lab - Execute your plan for Experiment A - Record notes and observations about the conduct of your experiment in your notebook. - Collect your experiment data in a spreadsheet and post it in your private channel on Teams - If required, arrange a time (with Andrew Chau) for a few team members to analyse your calibration and experimental samples.
	Homework	If required, analyse your calibration and

		experimental samples. • As a team, analyse your data, reflect on how the experiment went, and consider how your results relate to theory, literature and industrial practice. • As a team, write your Rotation 1 Technical Report.
Week 3: 13 June - 17 June	Assessment	• Complete and submit your Rotation 1 Technical Report (due 5 days after your Lab).
	Seminar	• No class - Queen's Birthday

	Tut-Lab	• Hour 1 - Meet with your lab demonstrator to debrief Rotation 1 and discuss the feedback on your reports.
		• Attend the lab to be briefed on your Rotation 2 experiment and the rig you will be using
		  ◦ Hour 2 - Distillation B
		  ◦ Hour 3 - Membrane B

	Homework	• Organise a time and location for your Rotation 2 Experiment Proposal presentation with your demonstrator. • Complete the online lesson for your Rotation 2 experiment and any recommended reading or literature reviews • As a team, develop your experimental plan for acheiving the provided experimental objectives. • Conduct a qualitative risk analysis of your experiment and complete the standard Risk Management Form (HS017) • Prepare for your Experiment Proposal presentation.
Week 4: 20 June - 24 June	Seminar	• Meet your Rotation 1 demonstrator at the prearranged time and location. • Present your Rotation 2 Experiment Proposal to your demonstrator (maximum 10 minutes). • Answer your demonstrator's questions on your Experiment Proposal. • Discuss whether your Risk Management Form is satisfactory.
	Laboratory	Rotation 2 / Experiment B - Week 1 • Before the Lab ◦ Carry out any changes or

		additional work recommended by your demonstrator ◦ Prepare tables for collecting data • During the Lab ◦ Execute your plan for Experiment B ◦ Record notes and observations about the conduct of your experiment in your notebook. ◦ Collect your experiment data in a spreadsheet and post it in your private channel on Teams ◦ If required, arrange a time (with Andrew Chau) for a few team members to analyse your calibration and experimental samples.
	Homework	• If required, analyse your calibration and experimental samples. • As a team and individually, analyse your data, reflect on how the experiment went, and consider how your results relate to theory, literature and industrial practice. • Try using process modelling/simulation to replicate or extend your results. • Review your experimental plan for next week and decide any changes with your team.
Week 5: 27 June - 1 July	Seminar	• Office Hours (11 am): Live online consultation time with no fixed agenda - join if you want help with anything. • Progress update (noon): Arrange a meeting with your demonstrator to discuss the outcomes from last week and your plans for this week (or do this at the start of your next lab session).
	Laboratory	Rotation 2 / Experiment B - Week 2 • Before the Lab ◦ Finalise your plan for Week 2 ◦ Prepare tables for collecting data • During the Lab ◦ Continue executing your plan for Experiment B ◦ Record notes and observations about the conduct of your experiment in your notebook. ◦ Collect your experiment data in a spreadsheet and post it in your

		◦ private channel on Teams ◦ If required, arrange a time (with Andrew Chau) for a few team members to analyse your calibration and experimental samples.
	Homework	• If required, analyse your calibration and experimental samples. • Individually, analyse your data, reflect on how the experiment went, and consider how your results relate to theory, literature and industrial practice. • Employ process modelling/simulation to replicate or extend your results. • Write your individual Technical Report for Rotation 2.
Week 6: 4 July - 8 July	Seminar	• Office Hours (11 am): Live online consultation time with no fixed agenda - join if you want help with anything.
	Assessment	• Continue working on your Rotation 2 Technical Report.
Week 7: 11 July - 15 July	Assessment	• Complete and submit your Rotation 2 Technical Report (due 12 days after your Lab).
	Seminar	• Office Hours (11 am): Live online consultation time with no fixed agenda - join if you want help with anything.
	Tut-Lab	• Hour 1 - Meet with your lab demonstrator to debrief Rotation 2 and discuss the feedback on your reports. • Attend the lab to be briefed on your Rotation 3 experiment and the rig you will be using ◦ Hour 2 - SLX, Spray Dryer ◦ Hour 3 - Crystalliser, Armfield
	Homework	• Organise a time and location for your Rotation 3 Experiment Proposal presentation with your demonstrator. • Complete the online lesson for your Rotation 3 experiment and any recommended reading or literature reviews • As a team, develop your experimental plan for acheiving the provided experimental objectives. • Conduct a qualitative risk analysis of your

		experiment and complete the standard Risk Management Form (HS017) • Prepare for your Experiment Proposal presentation.
Week 8: 18 July - 22 July	Seminar	• Meet your Rotation 1 demonstrator at the prearranged time and location. • Present your Rotation 3 Experiment Proposal to your demonstrator (maximum 10 minutes). • Answer your demonstrator's questions on your Experiment Proposal. • Discuss whether your Risk Management Form is satisfactory.

	Laboratory	Rotation 2 / Experiment C - Week 1
		
		• Before the Lab
		  ◦ Carry out any changes or additional work recommended by your demonstrator
		  ◦ Prepare tables for collecting data
		• During the Lab
		  ◦ Execute your plan for Experiment C
		  ◦ Record notes and observations about the conduct of your experiment in your notebook.
		  ◦ Collect your experiment data in a spreadsheet and post it in your private channel on Teams.

	Homework	• Analyse your data, reflect on how the experiment went, and consider how your results relate to theory, literature and industrial practice. • Calculate the PID parameters you will test during next week's lab class. • Review your experimental plan for next week and decide any changes with your team.
Week 9: 25 July - 29 July	Seminar	• Office Hours (11am): Online consultation time (no fixed agenda) - join if you want help with anything. • Progress update (noon): Arrange a meeting with your demonstrator to discuss the outcomes from last week and your plans for this week (or do this at the start of your next lab session).
	Laboratory	Rotation 3 / Experiment C - Week 2

		• Before the Lab
		  ◦ Finalise your plan for Week 2
		  ◦ Prepare tables for collecting data
		• During the Lab
		  ◦ Continue executing your plan for Experiment C
		  ◦ Record notes and observations about the conduct of your experiment in your notebook.
		  ◦ Collect your experiment data in a spreadsheet and post it in your private channel on Teams

	Homework	• Individually analyse your data, reflect on how the experiment went, and consider how your results relate to theory, literature and industrial practice. • Write your individual Technical Report for Rotation 3.
Week 10: 1 August - 5 August	Assessment	• Complete and submit your Rotation 3 Technical Report (due 5 days after your Lab).
	Seminar	• Office Hours (11 am): Live online consultation time with no fixed agenda - join if you want help with anything.
	Tut-Lab	• Hour 1 - Meet with your lab demonstrator to debrief Rotation 2 and discuss the feedback on your reports.
	Homework	• Read through the Assesment Guide for the Final Seminar. • As a team, develop your seminar presentation.

Resources

Prescribed Resources

Online lessons, videos and suggested readings, plus links to other online resources will be provided on the course Moodle page (http://moodle.telt.unsw.edu.au/). These will be progressively released as the course progresses.

You are expected to purchase the required PPE if you don't already have it. See " Laboratory Workshop Information" for what PPE is required.

Recommended Resources

There is no set textbook for this course. However, you may find it useful to refer to the recommended texts for the courses mentioned in the following sections:

- Pre-requisite courses and assumed knowledge
- Relationship with the discipline and the rest of your program

Study space for project courses

Students enrolled in selected project- and laboratory-based courses (such as CEIC3007) are granted access to Room 102 on Level 1 of the Science and Engineering Building (Map Ref. E8). Access to this space is subject to the following conditions:

- Students must follow any directions from teaching and technical staff.
- This space is provided for private study and/or small group project meetings related to courses taught by the School of Chemical Engineering.
- Some classes have booked this space and students should vacate the space during these classes.
- Students using the space are expected to leave the space in the same or better condition than they found it. Keeping this in mind, limited consumption of food and drink is permitted.

Failure to observe any of these conditions may result in your access being revoked.

Course Evaluation and Development

This is only the third time we have run this course. Based on student feedback we have:

- Simplified the assessment and reporting
- Increased demonstrator training on experiments and assessment practices
- Shifted the weighting of assessments for proposals and reports
- Rearranged how marking responsibilities are distributed to reduce variability in final marks
- Switched the format of reports so that the first report is now a group one - this allows more time for in depth feedback on the first report, and provides students with more time to complete their first individual report.
- Shifted the final seminar into the exam period to distance it from the Rotation 3 Technical Report due date.

Feedback is sought through in-term course surveys and the myExperience survey at the end of term.

However we appreciate feedback at any time! Let us know if there are things we can improve during term and we will do our best to assist.

Laboratory Workshop Information

Laboratory access is during your timetabled hours only, except as explicitly arranged with Andrew Chau. Lab classes finish strictly at the indicated end time so make sure you plan your work with this in mind. The indicated PPE is mandatory during labs.

The following personal protective equipment is mandatory in laboratory classes:

- safety glasses
- lab coat
- legs covered
- enclosed shoes
- face mask

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.

Please note that students will need to provide some documentary evidence to support absences from any assessments missed because of COVID-19 public health measures such as isolation. UNSW will **not** be insisting on medical certificates for COVID-related absences of 7 days or less, with the positive PCR or RAT result being sufficient. Longer absences due to 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 a list of hotspots 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	✓