School of Chemical Engineering

UNSW Engineering

CEIC3004

Process Equipment Design

Term 1, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Helen Rutlidge	h.rutlidge@unsw.edu.au	Tuesday 11am-1pm and via MS Teams		+612 8071 9864

Lecturers

Name	Email	Availability	Location	Phone
May Lim	m.lim@unsw.edu.au	Weeks 1-4: Wednesday 12-2pm, Thursday 2-4pm, and via MS Teams		
Sarah Grundy	s.grundy@unsw.edu.au	Weeks 5-9: Wednesday 12pm-2pm, Thursday 2-4pm, and via MS Teams		
Emma Lovell	e.lovell@unsw.edu.au	Weeks 5-9: Wednesday 12pm-2pm, Thursday 2-4pm, and via MS Teams		

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.

Questions about the this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.

Course Details

Units of Credit 6

Summary of the Course

This course teaches you how to select and design chemical process equipment. You will be introduced to a wide range of process equipment for different operations, including heat exchangers, pressure vessels and separation equipment ranging from distillation columns to centrifuges. The course is designed to assist you learn how to make equipment selection decisions and subsequently to conduct the detailed design of the selected equipment. Learning outcomes will be applied when designing chemical process plants in later studies (for example CEIC4001 Process Design Project) and in engineering practice.

You will undertake detailed studies in aspects of equipment design for several process units, such as a heat exchanger and a distillation column, to gain the skills involved with detailed equipment design. These designs will encompass aspects of design criteria specification, materials selection especially for processes with special requirements such as food processes, the importance of relevant design standards and legal requirements, and detailed mechanical design. This course is part of the chemical engineering design stream and thus the submission of a satisfactory design portfolio is part of the requirements for successful completion of the course.

Course Aims

The overall aim of this course is to enable you to develop an understanding of how to select and design equipment as relevant to a wide range of industrial applications. You should be able to define the different characteristics, configurations and operating conditions of the equipment and be familiar with the terms used in their design. You should have developed a good understanding of the advantages and limitations of the equipment for a given application and be able to advise a third party of the most appropriate option.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Select equipment used to carry out chemical reactions and to separate phases and the components within phases	PE2.1, PE2.2, PE3.6, PE3.5
2. Apply various methods for the detailed design of such equipment, with particular emphasis on distillation columns, heat exchangers and pressure vessels	PE2.1, PE2.2, PE2.3, PE3.5
3. Identify physical property data and other data needed for equipment design from a variety of sources.	PE3.4

Teaching Strategies

This course incorporates a blended learning environment in which background, contextual and basic

design information is delivered via online material Moodle, e.g. Moodle lesson. Lecture and tutorial activities will be devoted to teaching more complex information which extends that presented on-line and allows you to practice application of this knowledge in a supported environment. The on-line component will enable you to access the more readily digestible, background course material in your own time and incorporates self-assessment questions to provide instant feedback on your understanding. During the lectures and tutorials, time will be allocated to answer questions arising from the pre-class activities.

This course is divided into five sub-topics:

1. Equipment Selection (ES)
2. Separation Equipment Design (SED)
3. Heat Exchanger Design (HED)
4. Pressure Vessel Design (PVD)
5. Distillation Column Design (DCD)

Learning and teaching activities associated with each of these topics will vary depending on the topic learning required. Broadly, the course will comprise pre-class on-line activities, interactive on-line lectures and a 1 hour face-to-face tutorial. Formal summative quizzes will be provided at specific timepoints to give both you and your lecturer an indication of how your learning is progressing. Where possible, the incorporation of process simulation and modelling software, for example Aspen, will be incorporated to enable you to learn how to use modern approaches to speed up the design process as would be undertaken in industry. Invited guest speakers will also provide seminars as appropriate in face-to-face sessions to give specialised information and contextualise learning.

The group design assignment will run throughout the session giving you the opportunity to experience an industry-relevant design problem that will allow you to put your learning into practice. This will also provide you the opportunity to practice collaborative learning skills. This project will involve both a group design report as well as an individual design portfolio. It will prepare you directly for the 4th year capstone project, CEIC4001, for which this course is a pre-requisite. Tutorial sessions will be used to troubleshoot issues that you are facing in your group assignment and to provide feedback on proposed solutions.

Additional Course Information

Time commitment

UNSW expects students to spend approximately 150 hours to successfully complete a 6 UOC course. For CEIC3004, we expect approximately 80 hours to be spent developing your knowledge, e.g. through attending lectures, completing pre-class lessons and post-class quizzes; approximately 30 hours to be spent on a group assignment, including participation at associated tutorials; and approximately 40 hours developing your individual design portfolio, again including participation at the relevant tutorials.

Competence

Students are expected to enter CEIC3004 having developed competencies in all the material covered in the pre-requisite courses, at least. 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

When you attend face-to-face classes, we expect you to actively participate in the activities organised. This may mean listening, taking notes, asking questions or engaging in peer discussions. It may also mean working by yourself or in groups on tutorial exercises.

To complete the Design Assignment, 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.

Students are expected to contribute to online discussions through MS Teams. You may wish to discuss challenges faced through this course, ask questions about course content, discuss solutions to tutorial and practice questions. 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 all lectures and tutorials. 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 MS Teams and Moodle.

Assessment

Assessment criteria and standards

Students will be provided with further details of the assessment activities and the associated rubrics on Moodle and during class.

Feedback on assessment

Where possible, self-assessment questions are incorporated into on-line learning material to assist students gain feedback to gauge their understanding as they work through the lessons. Students will receive rapid feedback through undertaking on-line quizzes which will be available at regular intervals throughout the course, providing students with information as to where they can improve their learning while simultaneously providing data to the lecturers on how well students are understanding on-line and class material. Tutorials have been developed to support the design assignment in which students will have the opportunity to gain feedback from peers, class lecturers and tutors on their designs.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Quizzes	25%	Week 3, Week 5, Week 10	1, 2, 3
2. Group Design Assignment	25%	03/04/2023 09:00 PM	1, 2, 3
3. Individual Design Portfolio	50%	30/04/2023 09:00 PM	1, 2, 3

Assessment 1: Online Quizzes

Due date: Week 3, Week 5, Week 10

The quizzes are online assessments designed to give rapid, two-way feedback on student learning across the various topics. Assessment will be on the basis of technical accuracy of calculations and proper application of engineering design principles with appropriate assumptions (graduate attributes S4 and S7)

This is not a Turnitin assignment

Additional details

Further information on these tasks will be made available via Moodle.

Assessment 2: Group Design Assignment (Group)

Due date: 03/04/2023 09:00 PM

The equipment design assignment is a core part of this course. Engineering design is normally a team-based activity, and the project helps you to learn to do design in a team-based environment. The topic of the assignment and the assessment criteria will be given in a separate document. This component of the design assignment focuses on equipment selection. Design tutorials during weeks 1-5 will support the

completion of the group component of the design assignment with marks assigned where appropriate.

This is not a Turnitin assignment

Additional details

This task will be supported by a number of tutorials designed to keep you on track and give you feedback as you progress in this assignment. Further information on the assessment task will be made available via Moodle.

Assessment 3: Individual Design Portfolio

Due date: 30/04/2023 09:00 PM

Students will be required to complete an individual detailed design portfolio to demonstrate they have acquired the technical skills to undertake detailed equipment design. This component of the design assignment focuses on detailed equipment design of the equipment selected in the group design assignment. Design tutorials during weeks 7-10 will support the completion of the individual component of the design assignment with marks assigned where appropriate.

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

Additional details

This task will be supported by a number of tutorials designed to keep you on track and give you feedback as you progress in this assignment. Further information on the assessment task will be made available via Moodle.

Attendance Requirements

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

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 13 February - 17 February	Lecture	**Tuesday 11am-1pm (Chem Sci M18)**: Course Introduction and *Equipment Selection (ES) 1:* Introduction and Methods
	Lecture	**Wednesday 12-2pm (OMB G31)**: *Pressure Vessel Design PVD 1:* Introduction
	Lecture	**Thursday 2-4pm (OMB G31)**: *PV2:* Welding and Wall Thickness
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)** Tutorial - Design assignment orientation Tutorial attendance is compulsory
Week 2: 20 February - 24 February	Assessment	**Gantt Chart** due as a group submission on Monday 20th, 9pm
	Lecture	**Tuesday 11am-1pm (Chem Sci M18):** *ES 2:* Water treatment
	Lecture	**Wednesday 12pm-2pm (OMB G31):** *PVD 3:* Vessel Ends
	Lecture	**Thursday 2-4pm (OMB G31):** *PVD 4:* Load and Vessel Support
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**: Tutorial - Design assignment example assessment Tutorial attendance is compulsory
Week 3: 27 February - 3 March	Assessment	**Pressure Vessel Design Quiz** due Monday 27th Feb, 9pm **Prepare fishbowl contribution** due Friday 3rd March during tutorial
	Lecture	**Tuesday 11am-1pm (Chem Sci M18):** *ES 3:* Mining

	Lecture	**Wednesday 12-2pm (OMB G31):** *Heat exchange (HED) 1:* Intro to Heat Exchange
	Lecture	**Thursday 2-4pm (OMB G31):** *HED 2:* Heat Transfer Coefficients
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**: Tutorial - Fishbowl – Equipment selection methods Tutorial attendance is compulsory
Week 4: 6 March - 10 March	Lecture	**Tuesday 11am-1pm (Chem Sci M18):** *ES 4:* Air pollution abatement
	Lecture	**Wednesday 12-2pm (OMB G31):** *HED 3:* Pressure Drop
	Lecture	**Thursday 2-4pm (OMB G31):** *HED 4:* Heat Exchangers Advanced
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**: Tutorial - Group design presentation and reflection Tutorial attendance is compulsory
	Assessment	**Prepare group presentation** due Friday 10th during tutorial
Week 5: 13 March - 17 March	Assessment	**Equipment Selection and Heat Exchange Design Quizzes** due Monday 13th, 9pm **Group Reflection** due Monday 13th, 9pm **Team evaluation** due Tuesday 14th, 9pm **Draft group report** due Wednesday 15th, 9pm
	Lecture	**Monday 11am-1pm (Chem Sci M18):** *Separation Equipment Design (SED) 1:* Clarifiers
	Lecture	**Wednesday 12-2pm (OMB G31):** *Distillation Column Design (DCD) 1:* Multicomponent flash Calculations
	Lecture	**Thursday 2-4pm (OMB G31):** *DCD 2:* Shortcut methods
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**: Tutorial - Peer assessment of draft group report Tutorial attendance is compulsory

Week 6: 20 March - 24 March	Assessment	**Peer assessment** due Monday 20th, 9pm
Week 7: 27 March - 31 March	Lecture	**Tuesday 11am-1pm (Chem Sci M18):** *SED 3:* Filters
	Lecture	**Wednesday 10am-12pm (OMB G31):** *DCD 3:* Rigorous solution
	Lecture	**Thursday 2-4pm (OMB G31):** *DCD 4:* Process simulation on distillation column
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**: Tutorial - Individual design example assessment Tutorial attendance is compulsory
Week 8: 3 April - 7 April	Assessment	**Group Design Assignment** due Monday 3rd April, 9pm **Team evaluation** due Tuesday 4th April, 9pm
	Lecture	**Tuesday 11am-1pm (Chem Sci M18):** *SED 3:* Dryers
	Lecture	**Wednesday 12-2pm (OMB G31):** *DCD 5:* Plate efficiency; Approximate column sizing
	Lecture	**Thursday 2-4pm (OMB G31):** *DCD 6:* Plate contactors; plate hydraulic design
	Assessment	Group Design Assignment
Week 9: 10 April - 14 April	Lecture	**Tuesday 11am-1pm (Chem Sci M18):** *SED 4:* Combined processes – Membrane bioreactors
	Lecture	**Tuesday 12-2pm (OMB G31):** *DCD 7:* Enhanced distillation
	Lecture	**Thursday 2-4pm (OMB G31):** *DCD 8:* Residue curve maps
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**:Tutorial - Individual design presentation and reflection Tutorial attendance is compulsory
	Assessment	**Prepare presentation** by Friday 14th tutorial
Week 10: 17 April - 21 April	Assessment	**Separation Equipment Design and Distillation Column Design Quizzes** due Monday 17th, 9pm **Reflection** due Monday 17th, 9pm

		Draft individual report due Wednesday 19th, 9pm
	Tutorial	**Friday 3-4pm (Quad 1043 or Ainswth 201)**: Tutorial - Peer assessment of draft individual reports Tutorial attendance is compulsory
Stuvac: 22 April - 27 April	Assessment	**Peer assessment** due Monday 22th April, 9pm **Individual design portfolio** due Sunday 30th April, 9pm

Resources

Prescribed Resources

Online resources

Videos, lecture slides and suggested readings, tutorial exercises and solutions, plus links to other online resources will be provided on the course Moodle page. These will be progressively released as the semester progresses OR These are all currently available on the course website.

Recommended textbooks

Towler, Gavin & Sinnott, Ray K. (2013). Chemical Engineering Design - Principles, Practice and Economics of Plant and Process Design (2nd Edition). Elsevier. Online version available at:

http://app.knovel.com/hotlink/toc/id:kpCEDPPEP4/chemical-engineering/chemical-engineering

J.D. Seader & E.J. Henley, Separation Process Principles, John Wiley & Sons, 2nd or 3rd ed.

R.H. Perry & D.W. Green, Perry's Chemical Engineer's Handbook, latest edition, McGraw-Hill (available online in Library).

Additional material will be distributed on Moodle.

Other resources

You can access the full text of online resources available from the UNSW library using the UNSW VPN Service (https://www.it.unsw.edu.au/staff/vpn/#AccessingLibraryJournals).

Course Evaluation and Development

Student feedback will be gathered during the course using in-class polling and post-class questionnaires to gather rapid feedback that can be used to adapt the course to your needs as we move through the term. Towards the conclusion of the term, you will be sent a link to the more formal MyExperience survey which you can use to describe how you found the course and the lecturers. The results of the MyExperience survey are examined extensively to identify ways in which we can improve the course. Examples of ways in which this survey has been used to improve CEIC3004 include the addition of tutorials, the modification of peer review to better motivate students, and the inclusion of pre-class lessons.

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 not required unless specifically requested for an individual assessment task; 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 respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect. Please make it easy for the markers who are looking at your work to see your achievement and give you due credit.

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) and will not be accepted more than 5 days late. For some activities including Exams, Quizzes, Peer Feedback, 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 for **all** special consideration requests (including COVID-19-related requests), students will need documentary evidence to support absences from any classes or assessments.

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.

To help describe what we are looking for, here are some things that we consider to be quite acceptable (even desirable!) actions for many assessments, and some that we consider to be unacceptable in most circumstances. Please check with the instructions for your assessments and your course coordinator if you're unsure. As a rule of thumb, if you don't think you could look the lecturer in the eye and say "this is my own work", then it's not acceptable.

Acceptable actions	Unacceptable actions
✓ reading/searching through material we have given you, including lecture slides, course notes, sample problems, workshop problem solutions	✗ asking for help with an assessment from other students, friends, family
✓ reading/searching lecture transcripts	✗ asking for help on Q&A or homework help websites
✓ reading/searching resources that we have pointed you to as part of this course, including textbooks, journal articles, websites	✗ searching for answers to the specific assessment questions online or in shared documents
✓ reading/searching through your own notes for this course	✗ copying material from any source into your answers
✓ all of the above, for any previous courses	✗ using generative AI tools to complete or substantially complete an assessment for you
✓ using spell checkers, grammar checkers etc to improve the quality of your writing	✗ paying someone else to do the assessment for you
✓ studying course material with other students	

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.

Artificial intelligence tools such as ChatGPT, CodePilot, and built-in tools within Word are modern tools that are useful in some circumstances. In your degree at UNSW, we're teaching you skills that are needed for your professional life, which will include how to use AI tools responsibly plus lots of things that AI tools cannot do for you. AI tools already are (or will soon be) part of professional practice for all of us. However, if we were only teaching you things that AI could do, your degree would be worthless, and you wouldn't have a job in 5 years.

Whether the use of AI tools in an assessment is appropriate will depend on the goals of that assessment. As ever, you should discuss this with your lecturers – there will certainly be assessments where the use of AI tools is encouraged, as well as others where it would interfere with your learning and place you at a disadvantage later. Our goal is to help you learn how to ethically and professionally use the tools available to you. To learn more about the use of AI, see this discussion we have written where we analyse the strengths and weaknesses of generative AI tools and discuss when it is professionally and ethically appropriate to use them.

While AI may might provide useful tools to help with some assessments, UNSW's policy is quite clear that taking the output of generative AI and submitting it as your own work will never be appropriate, just as paying someone else to complete an assessment for you is serious misconduct.

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 for information about key dates, access to services, and lots more information
- Engineering Student Life - Current Student Resources for information about everything from getting to campus to our first year guide
- Student Support and Success for our UNSW team dedicated to helping with university life, visas, wellbeing, and academic performance
- Academic Skills to brush up on some study skills, time management skills, get one-on-one support in developing good learning habits, or join workshops on skills development
- Student Wellbeing, Health and Safety for information on the UNSW health services, mental health support, and lots of other useful wellbeing resources
- Equitable Learning Services for assistance with long term conditions that impact on your studies
- IT Service Centre for everything to do with computing, including installing UNSW licensed software, access to computing systems, on-campus WIFI and off-campus VPNs

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. Most 6 UoC courses will involve approximately 10-12 hours per week of work on your part. If you're not sure what to do in these hours of independent study, the resources on the UNSW Academic Skills pages offer some suggestions including: making summaries of lectures, read/summarise sections from the textbook, attempt workshop problems, reattempting workshop problems with some hints from the solutions, looking for additional problems in the textbook.

Full-time enrolment at university means that it is a *full-time* occupation for you and so you would typically need to devote 35 hours per week to your studies to suceed. Full-time enrolment at university is definitely incompatible with full-time employment. Part-time/casual employment can certainly fit into your study schedule but you will have to carefully balance your study obligations with that work and decide how much time for leisure, family, and sleep you want left after fullfilling your commitments to study and work. Everyone only gets 168 hours per week; overloading yourself with both study commitments and work commitments leads to poor outcomes and dissatisfaction with both, overtiredness, mental health issues, and general poor quality of life.

On-campus class attendance

In 2023, most classes at UNSW are running in a face-to-face mode only. Attendance is expected as is

participation in the classes. As an evidence-driven engineer or scientist, you'll be interested to know that education research has shown students learn more effectively when they come to class, and less effectively from lecture catch-up recordings. If you have to miss a class due to illness, for example, we expect you to catch up in your time, and within the coming couple of days.

For most courses that are running in an "in person" mode:

- Lectures are normally recorded to provide an opportunity to review material after the lecture; lecture recordings are not a substitute for attending and engaging with the live class.
- Workshops/tutorials are not normally recorded as the activities that are run within those sessions normally cannot be captured by a recording. These activities may also include assessable activities in some or all weeks of the term.
- Laboratories are not recorded and require in-person attendance. Missing laboratory sessions may require you to do a make-up session later in the term; if you miss too many laboratory sessions, it may be necessary to seek a Permitted Withdrawal from the course and reattempt it next year, or end up with an Unsatisfactory Fail for the course.
- Assessments will often require in-person attendance in a timetabled class or a scheduled examination.

This course outline will have further details in the Course Schedule and Assessment sections.

Class numbers are capped in each class to ensure appropriate facilities are available, to maintain student:staff ratios, and to help maintain adequate ventilation in the spaces. Only students enrolled in each specific 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 classes.

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 have COVID-19 or have been advised to self-isolate by NSW health or government authorities.

Asking Questions

Asking questions is an important part of learning. Learning to ask good questions and building the confidence to do so in front of others is an important professional skill that you need to develop. The best place to ask questions is during the scheduled classes for this course, with the obvious exception being questions that are private in nature such as special consideration or equitable learning plans. Between classes, you might also think of questions — some of those you might save up for the next class (write them down!), and some of them you might ask in a Q&A channel on Teams or a Q&A forum on Moodle. Please understand that staff won't be able to answer questions on Teams/Moodle immediately but will endeavour to do so during their regular working hours (i.e. probably not at midnight!) and when they are next working on this particular course (i.e. it might be a day or two). Please respect that staff are juggling multiple work responsibilities (teaching more than one course, supervising research students, doing experiments, writing grants, …) and also need to have balance between work and the rest of their life.

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

Images from Shutterstock and iStock

top left: istock-530976219 Water filters

top right: istock-541282320 Sewage treatment plant aerial view

bottom left: shutterstock_610961285 Two stages ethanol distillation towers

bottom right: shutterstock_468255293 Metallic plate in heat exchange machine in the food industrial plant

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	✓