School of Chemical Engineering

UNSW Engineering

CEIC1000, FOOD1130

Sustainable Product Engineering and Design

Term 3, 2021

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Sarah Grundy	s.grundy@unsw.edu.au	via Teams forum or email	SEB Level 4, Office 433	9385 4333

Lecturers

Name	Email	Availability	Location	Phone
Peter Wich	p.wich@unsw.edu.au	Via Teams forum or email	SEB Level 3, Office 321	9385 5664

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 covers introductory level scientific and engineering design concepts including sustainable development, and product and processing line management with an emphasis on sustainable manufacturing as the core theme throughout the course. Students will be taught to determine material and energy inputs and outputs for production as well as use of flowsheets and other graphical representations. Issues with respect to the sustainability, safety, engineering profession and careers are introduced, Laboratory, Pilot Plant or Industry visits (where appropriate) will be incorporated into the course to reinforce understanding of the manufacturing process. Students will also gain skills in information literacy via accessing and analysing sources of engineering and chemistry related information in a supported project-based learning environment.

Course Aims

In the global village of the current era, development impacts our world in such a way that we can easily deplete resources. If we want to secure a future for our children on this planet, we need to develop principles of sustainable development. Sustainability is no longer an adjunct, added after the product has been designed, but must now affect the design principles.

This course is designed to give you an introductory background to the disciplines and professions the process industries need for sustainable development, with a focus on Chemical and Food products and processes. The course may include guest lectures presented by industrial speakers from different areas, whom you will be able to question about products, processes, sustainability, and the careers of working professionals. It will give you a feel for the breadth and depth of the industry and the many different types of jobs available for graduates. You will learn about the various aspects that need to be considered in designing a product or process on a large scale in a changing global environment. The course will provide an opportunity to strengthen your technical communication skills, arguably the most important skill set you can have for any profession. Also key to any professional is information literacy, and this course will provide you with a number of tools that you will utilize throughout your degree and your career.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Describe what is involved in the chemical and food processing industries	PE1.6
2. Discuss major manufacturing processes and their relation to sustainability.	PE1.4, PE1.5
3. Evaluate and describe different methods for determining the viability of a process or product.	PE1.2, PE1.5, PE2.2, PE2.3
4. Contribute effectively in a team environment.	PE3.6

Learning Outcome	EA Stage 1 Competencies
5. Develop enhanced communication skills for a technical audience using conventions of the profession.	PE3.2
6. Research and use appropriate resources effectively to find further information on technical subjects.	PE3.2, PE3.4

Teaching Strategies

CEIC1000 employs student-centred learning as the basis for its instructional design and emphasises the importance of active learning. The teaching in this course is based on a blended classroom philosophy conducted in an online or distance mode with some face-to-face formal activities (as appropriate).

Student-centred activities form the basis of the course, which will draw on the diversity of the student cohort, including prior knowledge of the students, and allow engagement in relevant and challenging experiences. The classes are designed to be supportive and friendly, and include meaningful realistic learning and assessment tasks, as well as promote independent and collaborative study and enquiry.

Teaching strategies used during the course will include:

- two key lecture series running in parallel (technical and professional skills) to equip students with content which is aligned to their class assessments.
- a blended learning environment which includes formal learning activities delivered online, examples include Moodle pre and post lecture activities, to enable timetabled classes to be primarily devoted to interactive lectures/tutorials that enable students to practice application of the online material in a supported environment as well as support for the group project.
- the on-line component will enable you to digest the formal course material in your own time. During the face-to-face sessions (during lectures or tutorials), time will be allocated to answer any questions arising from the pre-class activities, practice problems relating to the online material for that week or your major group project.
- An integral part of this course is engagement in both on-line activities (Moodle lessons, videos, formative and summative quizzes) and face-to-face (where applicable) sessions. You must actively participate in classes, in the major group project and complete all set work to a satisfactory standard as discussed in class and in the course outline.

Additional Course Information

The course 6 units of credit (UoC) which means you shoudl expect to commit 150 hours to the course across the term. This time includes your engagement with the content, teaching and learning actvities and assessment tasks. There are 4 hours of formal contact per week and in some weeks pre and/or post class work weekly. There is NO final exam. Therefore means that there are many assessments which are linked to weekly activity(ies) and the central project-based activity. We will step you through the course weekly.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Class participation	15%	Not Applicable	1, 4, 6
2. Quizzes	15%	Not Applicable	1, 2, 3, 4, 5, 6
3. Group Project	55%	Not Applicable	1, 2, 3, 4, 5, 6
4. Peer Evaluation	15%	Not Applicable	4, 5

Assessment 1: Class participation

Submission notes: Submitted in Moodle

Collaborative exploration of course subjects and assembly of enrichment materials. This will enable students to actively participate in class activities in a peer-peer supportive learning environment. Marks will be given for class participation (CP) and quality of your reflective writing (R). Details of CP and R activities, and marking guidelines will be provided in Moodle. There will be three submissions (individual).

Week 1 (Friday 9pm): R#1 reflection on Industry guest speakers (5%)

Week 2 (Friday 9pm): R#2 reflection on team activity - MCIC Design Thinking workshop (5%)

Week 7 (Friday 9pm): R#3 reflection on Inspiring Alumni talks and research (5%) - reflect on all the industry, inspiring alumni and research guests in this course, also individual research into your professional identity and your own Inspiring Alumni

Assessment 2: Quizzes

Regular assessments covering understanding of lecture content, problem-solving skills, and outside reading assignments. All quizzes will be performed online and opened for at least 5 days. Evidence of work submission may be required for certain quizzes. There are three quizzes set at intervals in the course to cover course material from preceeding weeks and totals up to 15%. Below are indicative opening times of quizzes and further information can be found in Moodle.

Week 4 (Sunday 9pm) - Quiz #1

Week 8 (Sundy 9pm) - Quiz #2

Week 10 (Sunday 9pm) - Quiz #3

Assessment 3: Group Project (Group)

Submission notes: Submitted in Moodle

Major group project involving evaluation of a particular existing process-product combination, summary

of problems, and identification of potential solutions to economic, social or environmental concerns. A scaffolded approach has been taken where the group project will involve a utilize lecture concepts and outside reading. The group project is designed to assess your knowledge and ability in the following areas: your familiarity with the basics of the product and process engineering and design, your depth of knowledge of the fundamental concepts covered in the course and your ability to integrate these concepts into problem-solving, and to communicate relevant global issues in a clear and concise manner. In addtion because the course learning outcomes include a significant level of technical learning as well as professional skills that can be effectively assessed by a structured group project. Details will be provided in Moodle.

Note: This group project includes individual component submission and/or individual presentation and/or individual team evaluation.

Week 5 (Monday 9pm) - Individual technical research (10%)

Week 7 (Friday 9pm) - Group preliminary report (20%)**

Week 10 (in class) - Individual final pitch presentation (5%)

Exam week (TBC*) - Group final report (20%)**

*Due date to be confirmed based on student feedback but will in exam week (as there are NO final exams in this course).

**This mark may be adjusted based on peer evaluation (PE) by your team.

Assessment 4: Peer Evaluation

Peer evaluation (PE) is undertaken to ensure that students receive feedback from your peers for individual and/or group work activities. This is to help collaboration between individual group members by provided formative feedback at strategic intervals and encourage community learning environment.

Week 7 (Sunday 9pm): PE#1 - Team evaluation on group preliminary report. (3%). Formative.

Week 10 (Sunday 9pm): PE#2 - Peer feedback on Pitch presentation (10%). Marks based on quality of feedback.

Exam week (TBC): PE#3 - Team evaluation on group preliminary report. (2%). Formative.

Attendance Requirements

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

Course Schedule

P1: Professional skills series, TL1: Technical Lecture series

* Inspiring industry, reseach and alumni guests are key part of this course to exposure students to possible career pathways and will be invited as relevant.

Week	Lecture slot (Tuesday)	Tutorial slot (Wed/Thu)	CLO
1 S.Grundy	Course and major project intro, industry perspective on sustainable design (include SDG-17, Virtual plant).	Industry Career pathway* & reflective writing practice workshop	1-3
2 P.Wich	P1: Working in Teams	Design Thinking workshop with MCIC	2-4
3 P.Wich	P2: Technical writing	Technical writing workshop (research practice)	5,6
4 S.Grundy	TL1: Engineering basics (Flow diagrams), Resource management - materials.*	Mass and energy balance 1 (MEB 1) tutorial	1,2,3,5
5 S.Grundy	TL2: Resource management - energy.*	MEB II tutorial	1,2,3
6	Flexibility week (no formal classes)	Flexibility week	
7 S.Grundy	TL3: Resource management - waste.	Waste management tutorial	1,2,3
8 P.Wich	P3: Presentation skills and the "Pitch" workshop	Major project workshop and consultation	1,3,5
9 S.Grundy/ P.Wich	TL4: Course wrap and industry case studies ("Grand challenges" & industry case)	P4: Professional identity	1-6
10 S.Grundy/ P.Wich	Final "Pitch" presentation	Final "Pitch" presentation	1-6

Resources

Prescribed Resources

Dowling D and co. (2020). Engineering Your Future An Australasian Guide (4th Edition). Wiley.

Course Evaluation and Development

Recent changes, based on student and teaching team feedback

Based on feedback from students from T3, 2018 and 2019, discussions with teaching staff (including the previous coordinator), my direct observation of elements of the course in Term 3, 2019, and consideration of the implementation of the UNSW 3+ calendar in 2019, I implemented changes to the course for T3, 2019-2020.

- Structured approach to the course with a central theme “sustainable manufacturing” that connects all the key learning topic areas.
- Constructive alignment between the learning outcomes, learning and teaching activities and assessments. Lectures and tutorials are strategically designed to support assessments.
- Scaffolded approach in assessments, building upon knowledge of prior assessments and learning and teaching activities.
- Involvement of industry guest lecturers as subject matter experts which solves a “real” industry problem, providing students an authentic experience and preparing students for latter years at UNSW and their career.
- Interactive tutorials, hands-on experience and/or practical activity reinforcing the concept/s taught in class. This included addition of a Waste workshop in collaboration with the Michael Crouch Innovation Centre (MCIC). Overwhelming positive response by students and MCIC. With on-line teaching (due to Covid-19), the 2020 iteration continues to utilise interactive workshops but will be on-line.
- Creation of digital assets and on-line activities, including digital uplift of course Moodle pages

2021 iteration also resulte in the next iteration based on student feedback:

- minor summative asessments were taken out based on feedback of students but more focused assessments to enable in depth learning
- integration of virtual reality plant tour to support student learning remotely and connection to "real" world

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 **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID 19 illness or isolation** will be required.

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

Image Credit

The United Nations (un.org)

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	✓