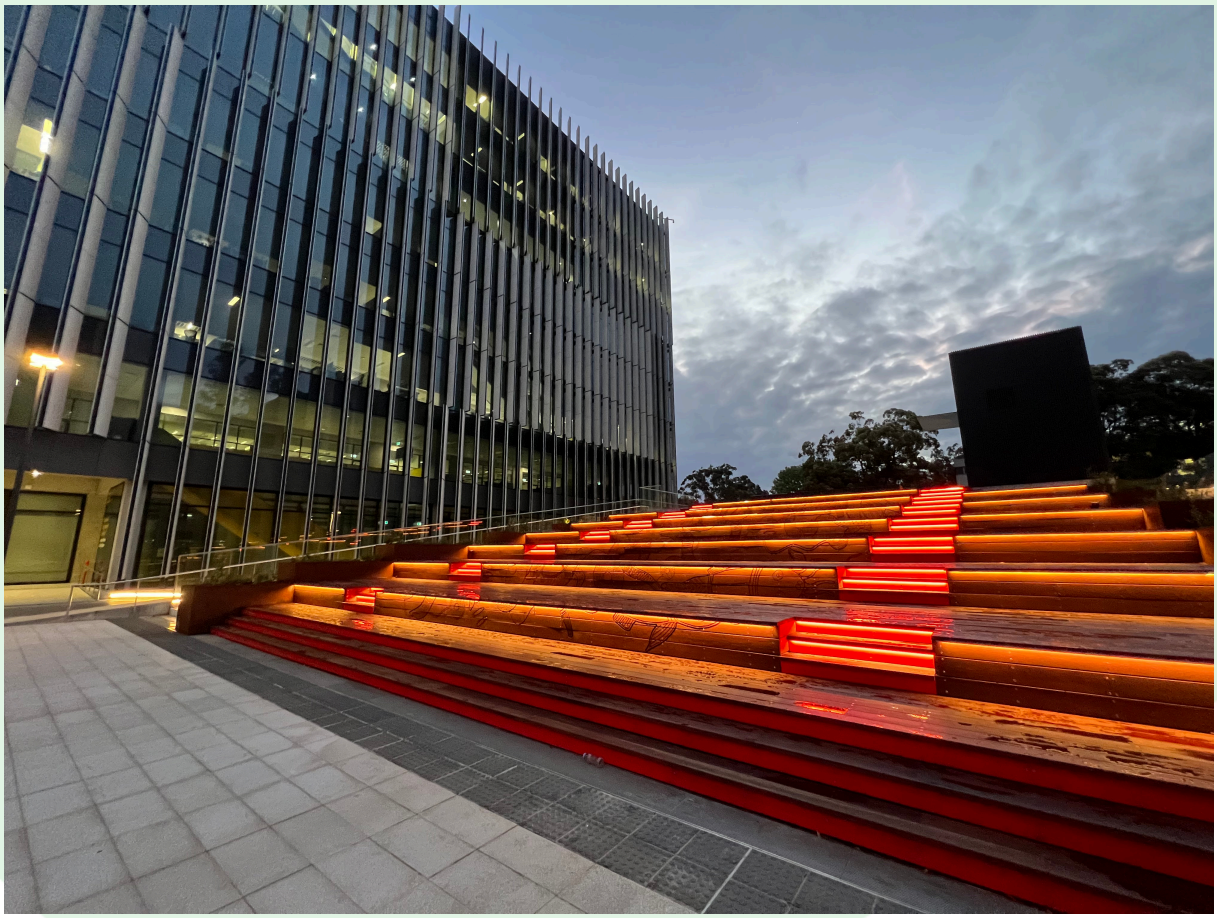
School of Chemical Engineering

UNSW Engineering

# CEIC4007

## Product Design Project Thesis A

Term 1, 2022



# Course Overview

## Staff Contact Details

### Convenors

| Name | Email | Availability | Location | Phone |
|---|---|---|---|---|
| Patrick Spicer | p.spicer@unsw.edu.au | | 318 Hilmer | |

## 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

Design and creative development is the engine of growth for economies and industry product portfolios. Chemical products touch consumers the world over, delivering innovations in pharmaceuticals, advanced materials, cosmetics, and foods. This course will enable students to explore global corporate innovations through case studies and active working groups, map consumer and market needs, and develop an intellectual property strategy as well as a working product prototype. Industry partners will work with students to explore, create, and assess their products as they go. Whether interested in developing new innovations for existing companies or for their own entrepreneurial efforts, students will gain confidence and independence that will make real contributions to the global economy.

In CEIC4007 students will identify product needs and map opportunities for a commercial chemical product development effort. The outcome of the course will be a novel product intellectual property and a clear plan to develop a working product prototype in the next course, CEIC4008.

## Course Aims

The Product Design Thesis requires students to apply knowledge from previous course to research, design, and plan a chemical product commercialisation strategy. Designing and delivering new products to market is a complex process. Open-ended problems must be solved, requiring creativity, study, and quantitative analysis of results. Multiple correct approaches can exist for these problems, and student innovation and creativity will be rewarded.

The Product Design Thesis poses these problems in the context of chemical or food product development, so the challenges draw on the food science and chemical engineering curriculum as well as a student's initiative, innovation, and entrepreneurship. Students will work through the design process, define consumer and product requirements, and pose the needs as an engineering problem. Students will collaborate with each other, map competitive and supportive literature and patents, and work constructively with others in a research and development environment.

Students will be able to:

- Apply engineering and general design principles to product design through case studies and self-directed identification and study of examples.
- Practice consumer and market research using publicly available and intellectual property documentation.
- Define consumer need and link technological barriers and enablers to the need.
- Develop a product intellectual property strategy.

## Course Learning Outcomes

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

| Learning Outcome | EA Stage 1 Competencies |
|---|---|
| 1. Develop a product design following industry and professional | PE2.2, PE2.3, PE2.4 |

| Learning Outcome | EA Stage 1 Competencies |
|---|---|
| engineering standards. | |
| 2. Critically reflect on a specialist body of knowledge, literature, patent, and others, related to their design goal. | PE1.3 |
| 3. Apply scientific and engineering methods to solve a practical commercial design problem. | PE2.1 |
| 4. Analyse past and preliminary data objectively using quantitative and mathematical methods. | PE1.2, PE2.1, PE2.2 |
| 5. Demonstrate oral and written communication in professional and lay domains. | PE3.2 |

# Professional Recognition of Course

This course is part of UNSW Food Science specialisations approved (2021-2026) by the Institute of Food Technologists Higher Education Review Board (IFT HERB).

## Teaching Strategies

Like other undergraduate thesis projects, the pair CEIC4007+CEIC4008 is designed to be a capstone experience. There is considerable scope for enquiry-based learning and students are expected to make use of the literature to help design and deliver a project over two terms. These courses will:

- Use real-world examples of failed and successful product designs, and their history, to motivate students to search and map additional product examples based on their own interests, social causes, or career goals.
- Connect working product designers and developers, as well as consumers of products, to students in order to motivate their own exploration and design concept development.
- Use in-class examples and outside class exercises to provide students with hands-on practice and self-directed exploration of new products, technologies, and market needs.

The Product Design Thesis (CEIC4007+CEIC4008) is designed to be a Thesis project course within the Faculty of Engineering’s Thesis rules and procedures.

Course aims

The Product Design Thesis requires students to bring together their knowledge from previous years of study to research, design and plan a commercialisation strategy for a chemical product. Designing and delivering a new product to market is a complex process in which open-ended problems must be addressed, requiring creativity and the acquisition, analysis and interpretation of results. There are multiple correct approaches to the problem and the creativity of the students is rewarded. The Product Design Thesis poses these problems through the lens of the development of a chemical product, and challenges cover the technical chemical engineering curriculum as well as innovation and entrepreneurship. Students will work through the design process, undertaking a requirements analysis and then working out how to reframe that in engineering terms. Students will collaborate with each other, look for literature support for their plans and to learn to work in a research and development environment.

Course Learning Outcomes

The Product Design Thesis CLOs are copied from the Thesis guide with editorial changes to be specific to the product design process.

Assessment Procedure

The weightings and activities recommended in the thesis guide are implemented within CEIC4007/4008. For the purposes of delivery within the entrepreneurship model adopted for these courses, the elements of the assessment items are regrouped as shown in the course outline; the relative weightings that are achieved are shown below.

CEIC4007 Chemical Product Design Thesis A

Mapping of CEIC4007 assessment items to Faculty of Engineering Thesis Marking Criteria. Percentages are total course marks. Decimals are the relative weighting within a row. Marking rubrics for individual assessment items in A-D will be weighted to achieve the allocation of marks required.

CEIC4007 course marks

Thesis course marks

A: Bi-weekly presentation 10%

B: Management plan presentations and supporting documentation
20%

C: Preliminary concept interview and supporting documentation
20%

D: Provisional patent report 50%

1. Interim report, 70% total, of which:

a. Literature review: 0.7

0.7

(49%)

b. Project planning for Thesis B: 0.2

0.1

(7%)

0.1

(7%)

c. Document presentation: 0.1

0.02

(3%)

0.02

(3%)

0.014

(1%)

2. Project work, 30% total, of which:

a. Intellectual contributions: 0.67

0.33

(10%)

0.33

(10%)

b. Presentations: 0.33

0.33

(10%)

Administrative matters

Extensions, late penalties, double markin

## Assessment

| Assessment task | Weight | Due Date | Course Learning Outcomes Assessed |
|---|---|---|---|
| 1. Presentations in biweekly meetings with group | 10% | 19/04/2021 04:00 PM | 1, 3, 4, 5 |
| 2. Preliminary concept interview | 20% | 29/03/2021 04:00 PM | 1, 2, 5 |
| 3. Product/Project Management Plans | 20% | 19/04/2021 04:00 PM | 3, 5 |
| 4. Final provisional patent and documentation of product | 50% | 26/04/2021 04:00 PM | 1, 2, 3, 4, 5 |

### Assessment 1: Presentations in biweekly meetings with group

**Start date:** 15/02/2021 04:00 PM
**Due date:** 19/04/2021 04:00 PM

Structured communication of progress, proposed direction, and needs. This will be marked as a group but will be the result of individual contributions and collaborative efforts. Initially these presentations will focus on case study, literature, and patent review, highlighting approaches and methods the students discover during their critical readings. As the project definition phase coalesces, a specific product concept will be developed and various aspects of that will be the focus of these discussions.

### Assessment 2: Preliminary concept interview

**Due date:** 29/03/2021 04:00 PM

Discussion of initial product justification to instructor. Once a product goal has been identified, discussions by the responsible individuals will focus on justification of the financial, competitive, innovative, and feasibility aspects of the goal. Feedback will be given to shape the project and ensure it is an appropriate scope for the time available and that the student assessments are accurate.

### Assessment 3: Product/Project Management Plans

**Due date:** 19/04/2021 04:00 PM

Initial, and then more developed, scope of product plan to instructor. With a product goal in mind, the students must identify the key roles needed for the project team in order to carry out the work successfully. These roles will be assumed and the responsibilities, the success criteria for the roles, and the plan for interaction and project execution will be mapped and communicated individually by the responsible person.

### Assessment 4: Final provisional patent and documentation of product

**Due date:** 26/04/2021 04:00 PM

Written summary of product intellectual property strategy with key recommendations. This document parallels the literature review submitted for traditional Thesis projects but will actually take the form of a detailed invention and patent disclosure. Several sections are needed for such a document and can have multiple forms and variations, but will allow individual work on each to be carried out:

- The work will be motivated and applications will be discussed.
- Past work and prior art will be reviewed and gaps or whitespace highlighted.
- Novelty and non-obviousness will be explained (though no legal judgements will be made or inferred).
- Conceptual examples of the new development and concept will be presented along with a plan for the second phase of the thesis to product a product prototype.

## Attendance Requirements

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

## Course Schedule

View class timetable

### Timetable

| Date | Type | Content |
|---|---|---|
| O-Week: 7 February - 11 February | | |
| Week 1: 14 February - 18 February | Lecture | Intro/Product Design and Development |
| Week 2: 21 February - 25 February | Lecture | How to define and utilise market needs? |
| | | |
| Week 3: 28 February - 4 March | Lecture | What is innovation?  How do we develop ideas? |
| Week 4: 7 March - 11 March | Lecture | Ideas and selection of ideas |
| Week 5: 14 March - 18 March | Lecture | Intellectual property, Patents |
| Week 6: 21 March - 25 March | Project | Flexibility week (use to work on project and background innovation) |
| Week 7: 28 March - 1 April | Lecture | **Preliminary presentations** |
| Week 8: 4 April - 8 April | Lecture | IP strategy construction |
| Week 9: 11 April - 15 April | Lecture | The competition: how do we find 'white space' for innovation and opportunity? |
| Week 10: 18 April - 22 April | Project | **Final concept presentation/Q&A** |

# Resources

## Prescribed Resources

Some course materials, and most assessment tasks are delivered through Moodle and students should check regularly for updates and pre-reading assignments.

## Recommended Resources

There are many books on the topics relevant to this course but no single textbook covers the whole spectrum. Literature and textbook references will be regularly assigned as pre-reading for lectures. Students will also be required to find information to augment lectures and help with their product development projects.

1. Bröckel, Ulrich, Willi Meier, and Gerhard Wagner, eds. *Product design and engineering: formulation of gels and pastes*. John Wiley & Sons, 2013.
2. Norton and Fryer, *Formulation Engineering of Foods*, Wiley, 2013.
3. Traitler, H., Coleman, B., & Burbidge, A. *Food Industry R&D: A New Approach*, Wiley, 2016.
4. Cussler and Moggridge, Chemical Product Design, Cambridge, 2011.
5. Sensory and Consumer Research in Food Product Design and Development, Howard R. Moskowitz and Jacqueline H. Beckley, 2012
6. New food product development: from concept to marketplace, G.W. Fuller, Boca Raton: CRC Press, 2011.
7. Developing new food products for a changing marketplace, ed. A.L. Brody and J.B. Lord, Lancaster: Technomic, 2000.

## Course Evaluation and Development

This course is highly interactive and constant feedback is solicited and discussed. As we document new insights these changes will be highlighted on our Teams site.

## Laboratory Workshop Information

This course works through lectures and workshops. The latter will involve frequent discussion and idea development workshops but no laboratories.

## 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

## 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 | |