

CEIC6712

Pharmaceutical Design and Engineering

Term 2, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Sophia Gu	zi.gu1@unsw.edu.au	Contact by email, via MS Teams or by appointment	Hilmer Building (E10) Room 322	+61 2 93854964

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

Students will learn how to design, develop and evaluate pharmaceutical and nutraceutical agents in line with research and industry methods, where chemical engineers, nutritionists and medical researchers work together to transform raw materials and small molecular agents to valuable pharma products. The contents will cover a broad range of competencies in pharmaceutical and nutraceutical sectors, including drug delivery, pharmaceutical design and processing, nanotechnology, drug regulation and approval, with emphasis on new technology innovation, translational process and commercialised healthcare-related products. The course will be offered in collaboration with relevant pharmaceutical/nutraceutical companies, allowing students to use knowledge and skills to solve drug development problems currently challenging the pharmaceutical and nutraceutical industry.

Course Aims

Week 1 - [A) Introduction to the course; B) Drug design and development; C) Drug commercialisation] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 2 - [A) Mini quiz; B) Pharmaceutical manufacturing of tablet formulation] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 3 - [A) Mini quiz revision; B) Pharmaceutical manufacturing of liquid dosage] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 4 - [A) Nanodrug; B) Antibacterial drugs and technologies; C) Biologics] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 5 - [A) Quiz; B) Introduction to oral and written assessments; C) Quiz revision; D) Pharmaceutical water treatment] & [1 x 2 hours lecture, 1 x 1 hour assessment]

Week 6 - Flexibility Week

Week 7 - [Pharmaceutical nanotechnology] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 8 - [A) Liposomes in pharmaceutical sector; B) 3D printing in pharmaceutical sector] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 9 - [Biopharmaceuticals and nutraceuticals] & [1 x 2 hours lecture, 1 x 1 hour lecture]

Week 10 - [Group oral presentation] & [1 x 2 hours assessment, 1 x 1 hour assessment]

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Illustrate and explain pharmaceutical design and engineering using examples of pharmaceutical products.	PE1.1, PE2.2
2. Articulate the procedure of drug development and features of each component of drug development.	PE1.1
3. Demonstrate and analyse the main components and technologies of manufacturing tablet and liquid pharmaceutical products.	PE1.1, PE2.3
4. Gain knowledge on advanced nanotechnology and biotechnology principles and techniques.	PE1.3, PE1.6
5. Transform gained knowledge and understanding one or two specific topics in depth and present it in written and oral manners.	PE2.1, PE2.4, PE3.2, PE3.6

Teaching Strategies

New material will be introduced in lectures, with reference to case studies and the literature. Students will undertake directed studies, accessing recent literature on pharmaceutical and nutraceutical engineering. Outputs from quizzes, written report and group presentations will be assessed.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Mini quiz	10%	07/06/2022 04:20 PM	2
2. Quiz	20%	28/06/2021 03:00 PM	1, 3
3. Group presentation	30%	03/08/2021 02:00 PM	1, 2, 3, 4, 5
4. Written report	40%	Week 11	1, 2, 3, 4

Assessment 1: Mini quiz

Start date: 07/06/2022 04:00 PM

Assessment length: 20 minutes

Due date: 07/06/2022 04:20 PM

Assessment to allow students to monitor, reinforce and reflect on their understanding of the Week 1 topics.

Assessment 2: Quiz

Start date: 28/06/2021 02:00 PM

Due date: 28/06/2021 03:00 PM

Assessment to allow students to monitor, reinforce and reflect on their understanding of the principles and applications of the topics (Weeks 2 – 3).

Assessment 3: Group presentation

Due date: 03/08/2021 02:00 PM

Assessment to evaluate how students work as a team to illustrate a problem and solutions in the context of pharmaceutical design and engineering. Multiple skills will be developed and reinforced through group oral presentation, including critical thinking, team working ability and communication.

The topic and content of the group presentation will be related to advanced pharmaceutical technologies and manufacturing. The assessment details will be introduced in Week 5.

All students will be expected to present components of the group presentations and participate in peer assessment of the presentations.

Assessment 4: Written report

Due date: Week 11

A written report to discuss contemporary issue(s) of pharmaceutical development provides an opportunity for students to further broaden their visions and improve deep and critical thinking.

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: 30 May - 3 June	Lecture	Week 1 - [A] Introduction to the course; B) Drug design and development; C) Drug commercialisation] & [1 x 2 hours lecture, 1 x 1 hour lecture]
Week 2: 6 June - 10 June	Blended	Week 2 - [A] Mini quiz; B) Pharmaceutical manufacturing of tablet formulation] & [1 x 2 hours lecture, 1 x 1 hour lecture]
	Assessment	Mini quiz
Week 3: 13 June - 17 June	Lecture	Week 3 - [A] Mini quiz revision; B) Pharmaceutical manufacturing of liquid dosage] & [1 x 2 hours lecture, 1 x 1 hour lecture]
Week 4: 20 June - 24 June	Lecture	Week 4 - [A] Nanodrug; B) Antibacterial drugs and technologies; C) Biologics] & [1 x 2 hours lecture, 1 x 1 hour lecture]
Week 5: 27 June - 1 July	Blended	Week 5 - [A] Quiz; B) Introduction to oral and written assessments; C) Quiz revision; D) Pharmaceutical water treatment] & [1 x 2 hours lecture, 1 x 1 hour assessment]
Week 6: 4 July - 8 July	Online Activity	Week 6 - Flexibility Week
Week 7: 11 July - 15 July	Lecture	Week 7 - [Pharmaceutical nanotechnology] & [1 x 2 hours lecture, 1 x 1 hour lecture]
Week 8: 18 July - 22 July	Lecture	Week 8 - [A] Liposomes in pharmaceutical sector; B) 3D printing in pharmaceutical sector] & [1 x 2 hours lecture, 1 x 1 hour lecture]
Week 9: 25 July - 29 July	Lecture	Week 9 - [Biopharmaceuticals and nutraceuticals] & [1 x 2 hours lecture, 1 x 1 hour lecture]
Week 10: 1 August - 5 August	Assessment	Week 10 - [Group oral presentation] & [1 x 2 hours assessment, 1 x 1 hour assessment]

Resources

Prescribed Resources

Reading materials are available on lecture slides.

Recommended Resources

Practical Pharmaceutical Engineering

By Gary Prager

Wiley-VCH, 2014

[Nanotechnology Applied To Pharmaceutical Technology](#)

Carolina Alves dos Santos editor. ; Mahendra Rai editor. ;

Cham : Springer International Publishing, 2017

[Pharmaceutical technology. Tableting technology](#) M. H Rubinstein; Pharmaceutical Technology Conference (5th : 1986 : Harrogate, England) ; Halsted Press ed., Chichester, West Sussex, England : Ellis Horwood ; New York : Distributed by Halsted Press, 1987

[Pharmaceutical Biotechnology](#)

Giora Z Feuerstein editor. ; Carlos A Guzm  n editor. ; SpringerLink (Online service) ;

New York, NY : Springer New York, 2009

[Pharmaceutical Biotechnology : Fundamentals and Applications](#)

Daan J. A Crommelin editor. ; Bernd Meibohm editor. ; Robert D Sindelar editor. ; SpringerLink (Online service) ;

4th ed 2013., New York, NY : Springer New York : Imprint: Springer, 2013

[Pharmaceutical biotechnology : drug discovery and clinical applications](#)

Oliver Kayser ; Rainer H M  ller ; John Wiley & Sons, Ltd. ;

Weinheim : Wiley-VCH, ©2004

[Nutrition and Bone Health](#)

Michael F Holick editor. ; Jeri W Nieves editor. ; SpringerLink (Online service) ;

2nd ed 2015., New York, NY : Springer New York : Imprint: Humana Press, 2015

Course Evaluation and Development

Students' feedback (incl. MyExperience survey) is highly valued and could be used to further develop the course to improve teaching and learning outcome.

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	✓