School of Chemical Engineering

UNSW Engineering

FOOD3060

Food Processing Principles

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Francisco Trujillo	francisco.trujillo@unsw.edu.au	Tuesday 4pm to 5pm, weeks 1 to 10	Room 420, Hilmer building (Enter via the Science and Engineering Building SEB E8)	+61 2 9385 5648

Demonstrators

Name	Email	Availability	Location	Phone
Ernest Tse	e.tse@unsw.edu.au			

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

This course teaches the basic physical and engineering principles required to understand the processing of foods at industrial scale. For large scale food processing you need to understand fluid flow, as liquid foods are pumped and transported through different parts of the processing plant, heat transfer, as heating and cooling are at core of food preservation, mass and energy balances, to understand the flow of mass and energy through the different processing stages, mass transfer, to understand key unit operations that are driven by concentration gradients such as drying and crystallization, particles and particle reduction, as many foods are composed of particles of different sizes, and mixing, which is a basic operation for making foods.

For this reason, the course concentrates on these important aspects:

1. Mass and energy balances, including basic principles of thermodynamics, to analyse processing operations,
2. Fluid flow, to understand the flowing properties of liquid foods,
3. Heat transfer, to understand the cooling and heating of food for preservation,
4. Thermal processing, to understand the effect of temperature on the inactivation of microorganisms for food preservation,
5. Mass transfer, to understand the movement of mass due to gradients of concentration,
6. Particles in foods, as many food ingredients are in the form of particles, and
7. Mixing, which is a fundamental operation for making foods.

Course Aims

The objective of this course is to teach the physical and engineering fundamentals to process raw materials into finished food products. Once those principles are understood, you can apply them to study in deep individual unit operations, which are the building blocks for converting raw materials into finished products, and that are taught in Unit Operations (FOOD3801 or FOOD8801). Some of those unit operations are refrigeration, dehydration, evaporation, extrusion, and packaging.

At the end of the course, you will understand the basic principles governing the transformation of foods during processing, and how to do simple mass and heat balances across a single processing stage in a food production plant. You will also understand the correlations between heat processing and food preservation, as well as the basics of mass transfer and the processing of food particles.

Course Learning Outcomes

1. Understanding and application of mass and energy balances to food processes
2. Understanding of flow and viscosity as related to the transport of liquid foods
3. Understanding and application of steady and unsteady state heat transfer.
4. Understanding and application of industrial thermal processing
5. Understanding and application of the principles of mass transfer and particle processing withing the context of foods.

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

The content is presented with lectures covering the physics of the studied processing principles, namely, mass and energy balances, fluid flow, heat transfer, thermal processing, mass transfer and processing of particles. However, the course is based on problem solving, not information presentation. The content of this course is concept-driven, and generally more complex than other courses, so will require your close attention and participation. This is not a subject that you can neglect for a week and expect to catch up easily.

You will be taught the theory and new concepts followed by showing how to solve problems, but to learn and develop problem solving skills, your active participation is required. Tutorials are integrated into the lecture time, where you are asked to solve problems during the class. In this way, you will own the concept and developed problem solving skills. If you do not go through this process, it is unlikely that you will understand how to use the material well enough to pass the course. The textbook provides a second viewpoint on the same material, with additional worked examples.

The classroom is interactive. Questions at all levels are encouraged. The student will not be able to learn adequately by downloading the slide content and missing the lecture. Active participation is essential.

Given the importance of practicing to cement the learning, five quizzes were implemented in Moodle covering the main topics of the course. The quizzes can be attempted multiple times and with unlimited time. They will be opened for about two weeks, and you will get the highest mark within that time frame. After the quiz is closed, you will be able to attempt them only for practicing as further attempts will not alter the mark. One assignment will be given to submit on week 10, practicing and developing more problem-solving skills.

Additional Course Information

The course is organised into 6 hours of contact per week over a 10-week trimester, except on week 6. Each lecture block may include lectures and tutorials sessions for practicing solving problems. Course materials will be provided through the Moodle course page.

Students are expected to have studied Physics (PHYS1111 or PHYS1121 or PHYS1131) and Mathematics (MATH1031 or MATH1131 or MATH1141) to Year 1 University standard or equivalent. Concepts taught in these courses are assumed knowledge in FOOD3060.

The processing principles taught in this course are used extensively in FOOD3801/FOOD8801 (Unit Operations in Food Processing) and in FOOD3010/FOOD8010 (Food Products and Ingredients Technology), where they are relevant to pasteurization and canning.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quizzes (5)	35%	Weeks 4, 6, 8, 10 and 11	1, 2, 3, 4, 5
1. Assignment (1)	20%	07/08/2022 11:00 PM	1, 2, 3
3. Final Examination	45%	TBC	1, 2, 3, 4, 5

Assessment 1: Quizzes (5)

Submission notes: Quizzes go from weeks 2 to 11. See the course schedule for the opening and closing dates of the quizzes.
Due date: Weeks 4, 6, 8, 10 and 11

Five quizzes are implemented during the term. The quizzes can be attempted multiple times and with unlimited time. They will be opened for about two to three weeks, and the highest mark will be given. You will work on quizzes from weeks 2 to 11.

Assessment 2: Assignment (1)

Due date: 07/08/2022 11:00 PM

The assignment will assess problem-solving skills. It will contain questions that need to be solved with figures, although not exclusively. The assignment submission will close on 11 pm of the Sunday of week 10.

Assessment 3: Final Examination

Due date: TBC

The final exam tests the understanding of the fundamental principles taught in the class and the acquired problem-solving skills.

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	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 01 Introduction, 02 Dimensions, units, systems & properties of foods. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 03 Mass balances. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 03 Mass balances.
Week 2: 6 June - 10 June	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 03 Mass balances. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 04 Thermodynamics and energy balances. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 04 Thermodynamics and energy balances.
	Assessment	Quiz 1 opens on Tuesday at 1 pm.
Week 3: 13 June - 17 June	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 04 Thermodynamics and energy balances. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 04 Thermodynamics and energy balances. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 04 Thermodynamics and energy balances.
	Assessment	Quiz 2 opens on Friday at 4 am.
Week 4: 20 June - 24	Lecture	Tuesday: 11am-1pm. UNSW Business School

June		105 (K-E12-105). Lecture on 05 Fluid Flow. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 05 Fluid Flow. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 05 Fluid Flow.
	Assessment	Quiz 1 closes on Tuesday at 11 am.
Week 5: 27 June - 1 July	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 06 Liquid transport system & pumps. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 06 Liquid transport system & pumps. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 07 Flow and viscosity measurements, and08 Non-Newtonian fluids.
	Assessment	Quiz 3 opens on Friday at 4 pm.
Week 6: 4 July - 8 July	Assessment	Quiz 2 closes on Friday at 4pm.
Week 7: 11 July - 15 July	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 09 Heat transfer. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 09 Heat transfer. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 09 Heat transfer.
Week 8: 18 July - 22 July	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 10 Heat exchangers. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 10 Heat exchangers & 11 Unsteady state heat transfer. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 11 Unsteady state heat transfer.
	Assessment	Quiz 3 closes on Tuesday at 11 am. Quiz 4 opens on Wednesday at 12 pm (noon).
Week 9: 25 July - 29 July	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 11 Unsteady state

		heat transfer. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 12 Thermal processing. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 12 Thermal processing.
Week 10: 1 August - 5 August	Lecture	Tuesday: 11am-1pm. UNSW Business School 105 (K-E12-105). Lecture on 12 Thermal processing. Wednesday: 10am-12pm. Central Lecture Block 1 (K-E19-G02). Lecture on 13 Mass Transfer. Thursday: 2pm-4pm. UNSW Business School 105 (K-E12-105). Lecture on 14 Particles in Foods & mixing.
	Assessment	Quiz 4 closes on Tuesday at 11 am. Quiz 5 opens on Tuesday at 1 pm. The due date of the assignment is on Sunday at 11 pm.
Study Week: 8 August - 11 August	Assessment	Quiz 5 closes on Sunday at 5 pm.

Resources

Prescribed Resources

Textbooks:

- Singh, R.P. and Heldman, D.R., 2013. *Introduction to Food Engineering, Enhanced*. Academic Press. https://www.sciencedirect.com/science/article/pii/B9780123985309000218
- Berk, Z., 2018. *Food process engineering and technology*. Academic press. Second edition available online via the UNSW library: https://www.sciencedirect.com/book/9780124159235/food-process-engineering-and-technology
- Fellows, P.J., 2009. *Food processing technology: principles and practice*. Elsevier. https://www.sciencedirect.com/book/9781845692162/food-processing-technology

Course Evaluation and Development

Student feedback is extremely valuable, and you are expected to provide feedback on the course. A Moodle tool has been created on the course web page which will become visible late in the session and allow you to evaluate the course.

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.