



MECH4880

Refrigeration and Air Conditioning 1

Term Three // 2020

Course Overview

Staff Contact Details

Convenors

| Name | Email | Availability | Location | Phone |
|----------------|------------------------|--------------|---|-------------------|
| Chris Menictas | c.menictas@unsw.edu.au | | Room 402F, Mechanical and Manufacturing Engineering | (02) 9385 6269 |

Demonstrators

| Name | Email | Availability | Location | Phone |
|---------------|------------------------|--------------|----------|-------|
| Hengrui Liu | h.liu@unsw.edu.au | | | |
| Dikshant Goel | mech.admin@unsw.edu.au | | | |
| Lava Kiran | mech.admin@unsw.edu.au | | | |

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries

Course Details

Credit Points 6

Summary of the Course

This course introduces the student to the terminology, principles and methods used in refrigeration and air conditioning.

The aim of this course is to take your knowledge of thermodynamics further, and in a much more general fashion, than you obtained in your first course in thermodynamics. In particular, to extend your theoretical background of the thermodynamics of refrigeration and air conditioning.

The term air conditioning implies the creation and maintenance of an atmosphere having such conditions of: (i) temperature, (ii) humidity, (iii) air circulation and (iv) air purity, as to produce the desired effects upon the occupants or materials (or both) in a given space. It is the simultaneous control of all these four factors within required limits which defines an air conditioning system.

Refrigeration is the control of the environment, e.g. air conditioning, cold room, refrigerators, display cabinets etc., and involves the use of refrigeration in one form or another.

In this course the topics covered include: psychrometry, cooling and heating loads, applied psychrometrics and air conditioning, system analysis and mathematical modelling, air duct design, refrigerants, vapour compression refrigeration, multi-stage vapour compression systems, components of vapour compression systems and other types of cooling systems.

Course Learning Outcomes

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

| Learning Outcome | EA Stage 1 Competencies |
|---|---|
| 1. Be familiar with the terminology associated with refrigeration and air conditioning | PE1.3 |
| 2. Apply the basic principles of psychrometry and applied psychrometrics | PE1.1 |
| 3. Undertake system analysis and mathematical modelling | PE1.1, PE1.2 |
| 4. Perform load calculations and elementary duct design | PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE3.2, PE3.5 |
| 5. Be familiar with refrigerants; vapour compression refrigeration systems | PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.2 |
| 6. Understand the components of vapour compression systems and other types of cooling systems | PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.2, PE2.4 |

Teaching Strategies

Please refer to the information in Moodle

Additional Course Information

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work. You should aim to spend about 12 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Assessment

Assessment Tasks

| Assessment task | Weight | Due Date | Student Learning Outcomes Assessed |
|-------------------|--------|----------------|------------------------------------|
| Assignments | 50% | Not Applicable | 1, 2, 3, 4, 5, 6 |
| Quiz | 20% | Not Applicable | 1, 2, 3 |
| Final Examination | 30% | Not Applicable | 1, 2, 4, 5, 6 |

Assessment Details

Assessment 1: Assignments

Details:

Assignment 1 40%

Part A due date: Monday 26 October, 5:00pm.

Part B due date: Monday 23 November, 5:00pm

Assignment 2 10%

Due date: Tuesday 10 November, 5:00pm

Assessment 2: Quiz

Start date: Not Applicable

Details: Quiz will be held on Wednesday Week 4 during lecture time.

Assessment 3: Final Examination

Start date: Not Applicable

Details: Exam is planned to be held during the examination period.

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: 8 September - 9 September | | |
| Week 1: 14 September - 18 September | Lecture | Introduction, Psychrometry, Applied Psychrometrics |
| Week 2: 21 September - 25 September | Lecture | Air Conditioning |
| Week 3: 28 September - 2 October | Lecture | Cooling and Heating Loads |
| Week 4: 5 October - 9 October | Assessment | Quiz |
| Week 5: 12 October - 16 October | Online Activity | Use of CAMEL Program |
| Week 7: 26 October - 30 October | Lecture | Components of Vapour Compression Systems and System Modelling and Refrigerants Labroatory Class |
| Week 8: 2 November - 6 November | Lecture | Vapour Compression Refrigeration |
| Week 9: 9 November - 13 November | Lecture | Multi-Stage Vapour Compression Systems |
| Week 10: 16 November - 20 November | Lecture | Other Types of Cooling Systems and Revision |

Resources

Prescribed Resources

- F.C. McQuiston, D. Parker and J.D. Spitler, *Heating, Ventilation, and Air Conditioning: Analysis and Design*, 6th Edition, John Wiley & Sons Inc., 2005 (*available for purchase in the bookshop and available in the UNSW library*).
- *Load Estimation and Psychrometrics: Application Manual DA9*. Australian Institute of Refrigeration, Air-conditioning and Heating. (*available for purchase in the bookshop*)

Recommended Resources

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include additional guest lectures to provide an industry perspective and case studies during various lectures. Recent changes include the addition of a mid-session quiz and the structure of assignment 1.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

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 policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the [Exams](#) webpage.

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 now 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 in T3.

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in 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. 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

Public distancing conditions must be followed for all T3 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. No over-enrolment is allowed in face-to-face class. Students enrolled in online classes can swap their enrolment from online to other additional, **but limited**, number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

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](#). **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.

In certain classroom and laboratory situations where 1.5 metres physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

Guidelines

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

Important Links

- [Moodle](#)
- [Lab Access](#)
- [Health and Safety](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Engineering Student Support Services Centre](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)
- [UNSW Mechanical and Manufacturing Engineering](#)
- [Equitable Learning Services](#)

Image Credit

Synergies in Sound 2016

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 | |