MMAN2700

Thermodynamics

Term 1, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Irene Renaud-Assemat	i.renaudassemat@unsw.edu.au	9am-5pm, Mon-Fri	Ainsworth Building J17, Room 208C	

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. The School will only be able to refer students on to the relevant team if contacted

Important Links

- Student Wellbeing
- Urgent Mental Health & Support
- Equitable Learning Services
- Faculty Transitional Arrangements for COVID-19
- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Makerspace
- UNSW Timetable
- UNSW Handbook

Course Details

Units of Credit 6

Summary of the Course

This course introduces the students to the terminology, principles and methods used in engineering thermodynamics.

The word “thermodynamics” was coined by Lord Kelvin from Greek words for heat (therme) and power (dynamis). Given that power is the rate at which work is performed, it follows that the word thermodynamics captures two of the most important ways in which energy is transferred, i.e. through heat and work. The subject of thermodynamics is therefore about energy and its transformations.

Thermodynamics has a broad application area ranging from microscopic organisms to common household appliances, transportation vehicles, power generation systems and even philosophy. The knowledge of thermodynamics gained in this course is essential to many other courses studied in mechanical engineering degree programme, such as advanced thermofluids, aerospace propulsion, internal combustion engines, refrigeration, air conditioning and solar energy.

This introductory course covers basic concepts of thermodynamics: Systems, property, state, path, process; Work and heat; Properties of pure substances; tables of properties and equations of state; First law of thermodynamics; Analysis of closed and open systems; Second law of thermodynamics; Carnot cycle; Clausius inequality, entropy, irreversibility, isentropic efficiencies; Air-standard cycles; Vapour cycles.

Course Aims

This course aims to prepare students for future studies in thermodynamics through the introduction of some common uses of thermodynamics and the analysis of thermodynamic cycles. Specifically, the aims of the course are to:

- Introduce students to the terminology associated with thermodynamics. Students will develop an understanding of the deeper meanings of familiar words like energy, heat, work, temperature, reversible as well as not so familiar words like entropy.
- Familiarise students with lst and 2nd laws of thermodynamics and teach students how to apply these laws.
- Instruct students in analysing air standard cycles, vapour power cycles for large power plants and vapour compression refrigeration cycles.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Demonstrate knowledge of key concepts of thermodynamics such as heat, work, internal energy.	PE1.1
2. Apply the 1st law of thermodynamics to solve steady-state problems on closed and open systems.	PE1.1, PE1.2, PE1.3

Learning Outcome	EA Stage 1 Competencies
3. Apply the 2nd law of thermodynamics to analyse the behaviour of internal combustion engines (air-standard cycles), vapor and refrigeration cycles	PE1.1, PE1.2, PE1.3, PE2.1
4. Carry out, on working machinery, measurements of thermodynamic and and mechanical properties and identify links between theoretical analysis methods and actual performance.	PE1.3, PE2.2

Teaching Strategies

Lectures are designed to cover the terminology and key concepts in thermodynamics. They present how the theory is applied through real-world engineering examples. During the 2-hour sessions, there will be a succession of short lectures, interactive worked examples and Q&A.

Course content (lecture notes, example sheets...) will be available on the Moodle course page. Weekly example classes will be run by demonstrators answering questions relating to learned content and assisting the class with solving problem sheets. Students will be expected to work independently on the problem sheets, seek out necessary information or ask for help. Solutions will be provided at the end of each topic.

There are 2 compulsory laboratories in weeks 4, 5 and 8, 9. Laboratories will allow students to perform lab experiments that are based upon less intuitive concepts in thermodynamics and compare their actual data with the theory. Hence, students will develop skills such as following written instructions and recording readings and data. A laboratory report will allow students to demonstrate deeper understanding of what is occurring in the laboratory, and develop written communication proficiency.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Laboratory 1	15%	Due at 5pm the day after attending the lab. Lab 1 (weeks 4,5)	1, 2, 4
2. Laboratory 2	15%	Due at 5pm the day after attending the lab. Lab 2 (weeks 8,9)	1, 2, 3, 4
3. Mid-term Test	30%	31/03/2022 07:00 PM - Week 7	1, 2
4. Final Exam	40%	Exam Period	1, 2, 3

Assessment 1: Laboratory 1

Assessment length: 2-hour lab, 10-page report
Submission notes: Moodle Hand In
Due date: Due at 5pm the day after attending the lab. Lab 1 (weeks 4,5)
Deadline for absolute fail: Late penalty of 20% per calendar day
Marks returned: Within two weeks from submission

Laboratory 1 is held in week 4 or 5 (thermodynamic processes experiment).

The purpose of this assignment is to allow you to perform lab experiments that are based upon less intuitive concepts in thermodynamics and compare their actual data with the theory. You will get the opportunity to develop skills such as following written instructions, recording readings and data and writing technical reports. This will help you get a deeper understanding of concepts taught in class and develop written communication proficiency.

Assessment criteria

Preliminary work

Students are required to complete a pre-laboratory work to demonstrate their knowledge prior to attending the laboratory or accessing the experiment video. Preliminary work answers are to be made via the submission portal available on Moodle. All students are to submit their prelab work before attending the lab. For face-to-face students, please bring a copy of your preliminary work to the lab to record your data into.

Lab report

Students will write a laboratory report in which they analyse the recorded data during the laboratory sessions and demonstrate their understanding of the thermodynamic principles at work. Submission of the post-processing of your results is to be made via the submission portal made available on Moodle. All submissions must be typed and be in a single document in pdf format. Screenshots or images of handwritten answers embedded into a document will not be accepted. Your submission is due at 5pm on

the day following lab attendance. Details for this report will be shared on Moodle closer to the due date.

Marking

Marking guidelines for laboratory submissions will be provided at the same time as laboratory report details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Assessment of laboratory reports will contribute 2x15% to the final mark. Marks will be allocated for completion of preliminary analysis, results obtained and calculations made during the laboratory period (5 marks for preliminary work, 10 marks for measurements, data analysis and conclusions).

Submission of preliminary work which is not your own, or copying during the laboratory period, will result in a mark of zero for the laboratory.

Assessment 2: Laboratory 2

Assessment length: 2-hour lab; 10-page report
Submission notes: Moodle Hand In
Due date: Due at 5pm the day after attending the lab. Lab 2 (weeks 8,9)
Deadline for absolute fail: Late penalty of 20% per calendar day
Marks returned: Within two weeks from submission

Laboratory 2 is held in week 8 or 9 (compressor performance).

The purpose of this assignment is to allow you to perform lab experiments that are based upon less intuitive concepts in thermodynamics and compare their actual data with the theory. You will get the opportunity to develop skills such as following written instructions, recording readings and data and writing technical reports. This will help you get a deeper understanding of concepts taught in class and develop written communication proficiency.

Assessment criteria

Same as laboratory 1

Assessment 3: Mid-term Test

Start date: 31/03/2022 06:00 PM - Week 7
Assessment length: 1 hour
Submission notes: Moodle Quiz
Due date: 31/03/2022 07:00 PM - Week 7
Deadline for absolute fail: N/A
Marks returned: Within 2 days from submission

The purpose of this assignment is to examine your knowledge of key concepts of thermodynamics and your ability to apply the 1st law of thermodynamics to solve steady-state problems on closed systems. The Mid-term test is a Moodle quiz covering the first 3 topics: Systems and Energy, Energy balances and Properties of pure substances. This is an open-book test.

A mock quiz will be released before this assignment to familiarise yourself with Moodle quiz and the type of questions (including multiple choice/answer and numerical answer questions). This practice quiz is

formative and it does not reflect the level of difficulty of the actual mid-term test.

Assessment 4: Final Exam

Start date: Exam Period
Assessment length: 2 hours
Submission notes: Moodle Hand In
Due date: Exam Period
Deadline for absolute fail: N/A
Marks returned: Upon release of final results

The purpose of this assignment is to examine your ability to solve problems on closed and open systems and to analyse the behaviour of different cycles such as air-standard cycles (internal combustion engines), vapor and refrigeration cycles. The final exam is open-book and will assess the entire content of this course.

Past exam papers are not available. However, problem sheets with detailed solutions will be provided to students to pratice the skills required for the final exam. Some exam questions have been included in the worked examples covered in lectures and example classes. Support is also available from demonstrators and course convenor.

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: 14 February - 18 February	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 1: Systems and Energy • Course organisation • What is thermodynamics • Early engines • A problem solving template • Systems and their properties (definitions)
Week 2: 21 February - 25 February	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 1: Systems and Energy • Work and heat • Sign convention • 1st law of thermodynamics and its 3 corollaries • Internal energy • Ideal gases
	Workshop	Example class
Week 3: 28 February - 4 March	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 2: Energy balances • Flow work • Enthalpy • Specific heats • Moving boundary work
	Workshop	Example class
Week 4: 7 March - 11 March	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 2: Energy balances • Worked examples (moving boundary work)

		• Isentropic and polytropic processes + worked examples
	Laboratory	Lab 1: Thermodynamic processes experiment (Thermoboard)
	Workshop	Example class
Week 5: 14 March - 18 March	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 3: Properties of pure substances • Ideal gas vs Pure substance • Phase diagram • p-V and p-T diagrams • Thermodynamics property tables • Worked examples
	Laboratory	Lab 1: Thermodynamic processes experiment (Thermoboard)
	Workshop	Example class
Week 6: 21 March - 25 March	-- Select --	Flexibility week
	Workshop	Example class
Week 7: 28 March - 1 April	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 4: 1st law of thermodynamics in open systems • Steady flow energy equation • Nozzle and diffusers • Turbines / Compressors / Throttle valves
	Workshop	Example class
Week 8: 4 April - 8 April	Lecture	Wednesday 4-6pm; Thursday 3-5pm Topic 5: Second law of thermodynamics • Reversible heat engine • Kelvin-Planck and Clausius statements • Refrigerators and Heat pumps • Revesibility • Carnot cycle
	Laboratory	Lab 2: Compressor performance
	Workshop	Example class
Week 9: 11 April - 15 April	Lecture	Wednesday 4-6pm; Thursday 3-5pm

		Topic 5: Second law of thermodynamics • The increase of entropy principle • Isentropic efficiencies (turbines and compressors) • Applications
	Laboratory	Lab 2: Compressor performance
	Workshop	Example class
Week 10: 18 April - 22 April	Lecture	Wednesday 4-6pm; Thursday 3-5pm Revisions
	Workshop	Example class
Study Week: 25 April - 28 April	-- Select --	

Resources

Prescribed Resources

Textbooks

- Y.A. Cengel, M.A. Boles & M. Kanoglu, (2019) Thermodynamics, an engineering approach, 9th, S.I. Edition, McGraw Hill Education..
- G.F.C. Rogers & Y.R. Mayhew, Thermodynamic and Transport Properties of Fluids, S.I. Units, Basil Blackwell.

Both of these are available in the UNSW bookshop (links for the Print and Digital boks below).

Print:

https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9789813157873

https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9780631197034

Digital:

https://unswbookshop.vitalsource.com/products/-v9789814821575

The first reference contains a set of steam tables, they are of a different type to those found in Mayhew & Rogers. You will be required to be able to use those found in Mayhew & Rogers in the midterm test and final exam.

Recommended Resources

Suggested additional reading

- M. J. Moran, H. N. Shapiro, D. D. Boettner & M. B. Bailey, (2018) Fundamentals of engineering thermodynamics, S.I. version, 9th Edition, John Wiley & Sons.
- R. Scruton, (2012) Green Philosophy. How to think seriously about the planet, Atlantic Books London.
- Schmidt, (2019) Technical thermodynamics for engineers, basics and applications, Springer.
- A. Bejan, (2006) Advanced engineering thermodynamics, 3rd edition, John Wiley & Sons.
- R.E. Sonntag and G.J. Van Wylen, (1991) Introduction to thermodynamics classical and statistical, 3rd Edition, John Wiley & Sons.
- D.S. Lemons, (2013) A students guide to entropy, Cambridge University Press.
- J.R. Reisel, (2016) Principles of engineering thermodynamics, S.I. edition, Cengage Learning.
- P.W. Atkins, (2008) Four laws that drive the universe, Oxford University Press, or
- P.W. Atkins, (2010) The laws of thermodynamics. A Very Short Introduction., Oxford University Press. They are the same book.
- P.W. Atkins, (1994) The 2nd Law, energy, chaos & form, Scientific American Publications.
- P.W. Atkins, (2003) Galileo's finger, the ten great ideas of science, Oxford University Press (Chapters 3 & 4).
- H.C. von Baeyer, (1999) Warmth disperses and time passes, the history of heat, (previously published as Maxwell's demon), The Modern Library, New York.

Most of these titles are available in the UNSW Library and are useful as additional reading material, giving good descriptions.

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 more interactive online lectures with the addition of PollEverywhere quizzes and worked examples. Solutions to the problem sheets will also be provided to the students to support their learning.

Laboratory Workshop Information

Laboratories

You are required to obtain a notebook to record results of each experiment and analysis carried out whilst in the laboratory.

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.

The laboratory demonstrators will give instructions on how to operate the equipment and will explain what is required of you. If in doubt, ask. It is important that you fully understand the experiment at the time it is being carried out, when instruction is available. In some experiments you are only required to take readings at intervals, use the intermediate time to ask questions and find out what other members of your group are doing. Little is learned merely by sitting waiting to make a measurement - much is learned by inquiry and discussion.

Attendance

Attendance at all laboratory experiments to which you are assigned is compulsory and a register is taken. If you are unable to attend, due to illness, it is important that you apply for Special Consideration and inform your lecturer as soon as possible so that you may be reassigned to that experiment at a later date.

Transferring between groups

Transfers between groups must be arranged through the lecturer.

Preparation

Preparation prior to the laboratory periods is essential. Study the laboratory notes so that you know what the experiment is about in advance of each laboratory session. If you arrive without the necessary preparation, you may not be allocated the laboratory mark.

Bring a calculator to all laboratory periods.

You will not be admitted to the laboratory unless you are appropriately dressed for safe working,

have a laboratory book, a calculator and present the assigned preliminary work.

Laboratory Safety

All staff and students must observe all safety requirements in the laboratory. You must come to the laboratory dressed for work, NO LOOSE OR BAGGY CLOTHING, NO SANDALS OR BARE FEET. Before beginning any experiment, inspect all equipment you will use for potential hazards. While using laboratory equipment, keep alert for any developing hazard, e.g. unusual noise, vibration, unusual data trends etc.

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, for a minimum of zero marks.

The late penalty is applied per calendar day (or part thereof), including weekends and public holidays, that the assessment is overdue.

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

- Your course has an assessment task worth a total of **30 marks (Max Possible Mark)**
- You submit the assessment **2 days after the due date**
- The assessment is marked as usual and achieves a score of **20 marks (Awarded Mark)**
- The late policy is applied using **Late Mark = Awarded Mark - (Days*Penalty per Day)*Max Possible Mark**. Your adjusted final score is **8 marks** (20 - ((2*0.2)*30)).

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.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

Outcome	Explanation	Example
Time extension	Student provided more time to submit the assessment	e.g. 1 more week of time granted to submit a report
Supplementary assessment	Student provided an alternate assessment at a later date/time	e.g. a supplementary exam is scheduled during the supplementary exam period of the term
Substitute item	The mark for the missed assessment is substituted with the mark of another assessment	e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc
Exemption	All course marks are recalculated excluding this assessment and its weighting	e.g. The course has an assessment structure of: - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: - Assignments 50% - Final Exam 50% as though the Lab report did not exist
Non-standard	Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis	e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for

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, 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

****T1-2022 UPDATE****
- -

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to 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 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 polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators

- Academic Honesty and Plagiarism

Image Credit

Photo by Stephen Blake March 2017, Willis Annexe (J18) Thermofluids lab

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	