



MECH8201

Energy Sustainable Design and HVAC

Session 2, In person-scheduled-weekday, North Ryde 2026

School of Engineering

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Disclaimer

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General Information

Unit convenor and teaching staff

Convenor

Dr Ann Lee

ann.lee@mq.edu.au

Contact via Email

9WW-2.119

Wednesday 1pm-2pm

Credit points

10

Prerequisites

40 CP at 6000 level or above including MECH6001

Corequisites

Co-badged status

MECH4002

Unit description

This unit critically assesses energy-conscious design procedures, focusing on energy efficiency, and the planning of heating, ventilation, and air-conditioning (HVAC) systems. The unit encompasses in-depth exploration of psychrometric analysis, calculations for heating and cooling loads, the selection of air-conditioning equipment, methodologies for duct design, as well as a comprehensive study of refrigeration concepts and their practical applications. Topics also include refrigeration cycles, refrigeration equipment components such as compressors, condensers, evaporators, and expansion devices, as well as the design and analysis of vapour compression systems. Upon completing this unit, students will demonstrate the application of critical design considerations in industry scale energy efficient HVAC systems design.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals ([UNSDGs](#)) Affordable and Clean Energy; Industry, Innovation and Infrastructure; Sustainable Cities and Communities

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Apply comprehensive knowledge of energy sustainable design processes to evaluate and justify the feasibility and impact of an engineering project in terms of environmental, social and economic sustainability

ULO2: Design real-world HVAC systems for different scenarios by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer using appropriate tools and methods

ULO3: Critically analyse, research and apply established theories to the body of knowledge or practice in refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.

ULO4: Apply specific, higher-level skills in project management, teamwork, professional conduct and ethical practice towards the completion of complex engineering projects

ULO5: Evaluate and apply problem-solving techniques aligned with industry requirements

General Assessment Information

Student must achieve at least a 50% aggregate grade in order to obtain a passing grade (P/CR/D/HD).

Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, the University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Logbook

Logbook tasks will be posted on iLearn at least two weeks prior to their due date. Submissions will not be accepted after the solutions have been demonstrated by the teaching staff.

Logbooks may be handwritten or typed but must be neat, legible, and logically structured. Poorly organised or illegible submissions will not be marked. Logbooks will be marked in person by the class's assigned casual academic during Week 8. Students must bring their completed logbooks to class for assessment.

Group Project Presentation

The final presentation will be delivered as a group presentation. Each student group is required to present their HVAC design for a selected building to a panel comprising industry experts and internal assessors. The presentation should highlight the group's design innovations and clearly articulate the value proposition of their proposed solution.

A statement of individual contribution, with percentage allocation for each group member, must be submitted alongside the presentation. This is essential for ensuring fair and transparent assessment. Discrepancies in contribution may result in differentiated individual marks. Attendance during all presentation sessions is expected, as students are encouraged to learn from their peers' work.

Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see <https://students.mq.edu.au/study/assessment-exams/assessments> for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11:55 pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

The unit will be graded according to the Macquarie University Grading policy. The following grades will be used according to the listed numerical range:

HD	High Distinction	85-100
D	Distinction	75-84
Cr	Credit	65-74
P	Pass	50-64
F	Fail	0-49

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
<u>Group Project Presentation</u>	35%	No	Week 12	Individual and Group	No	Observed
<u>Professional Engagement and Logbook</u>	30%	No	17/09/2026	Individual	Yes	Open
<u>Final Exam</u>	35%	No	Exam period	Individual	No	Observed

Group Project Presentation

Assessment Type ¹: Presentation task

Indicative Time on Task ²: 30 hours

Due: **Week 12**

Weighting: **35%**

Groupwork/Individual: Individual and Group

Short extension ³: No

AI Approach: Observed

The final presentation will be conducted in a group presentation format. Each student group is required to present their HVAC design for a selected building to a panel comprising industry experts and internal assessors. The presentation should highlight the group's design innovations and clearly articulate the value proposition of their proposed solution.

On successful completion you will be able to:

- Apply comprehensive knowledge of energy sustainable design processes to evaluate and justify the feasibility and impact of an engineering project in terms of environmental, social and economic sustainability
- Design real-world HVAC systems for different scenarios by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer using appropriate tools and methods
- Critically analyse, research and apply established theories to the body of knowledge or practice in refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Apply specific, higher-level skills in project management, teamwork, professional conduct and ethical practice towards the completion of complex engineering projects
- Evaluate and apply problem-solving techniques aligned with industry requirements

Professional Engagement and Logbook

Assessment Type ¹: Portfolio

Indicative Time on Task ²: 27 hours

Due: **17/09/2026**

Weighting: **30%**

Groupwork/Individual: Individual

Short extension ³: Yes

AI Approach: Open

Students are required to maintain a physical logbook that documents their engagement and progress throughout the semester. This logbook must demonstrate professional and consistent work output and reflect satisfactory participation in the majority of learning activities. The final presented work must be traceable through the documented progression in the logbook. The logbook will be assessed during the first half of the session.

On successful completion you will be able to:

- Apply comprehensive knowledge of energy sustainable design processes to evaluate and justify the feasibility and impact of an engineering project in terms of environmental, social and economic sustainability
- Design real-world HVAC systems for different scenarios by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer using appropriate tools and methods
- Critically analyse, research and apply established theories to the body of knowledge or practice in refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Apply specific, higher-level skills in project management, teamwork, professional conduct and ethical practice towards the completion of complex engineering projects
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Final Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 3 hours

Due: **Exam period**

Weighting: **35%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

You will undertake a final examination during the formal examination period.

On successful completion you will be able to:

- Apply comprehensive knowledge of energy sustainable design processes to evaluate and justify the feasibility and impact of an engineering project in terms of environmental, social and economic sustainability
- Design real-world HVAC systems for different scenarios by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer using appropriate tools and methods
- Critically analyse, research and apply established theories to the body of knowledge or practice in refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Evaluate and apply problem-solving techniques aligned with industry requirements

¹ If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- [Academic Success](#) for academic skills support.

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation.

³ An automatic short extension is available for some assessments. Apply through the [Service Connect Portal](#).

Delivery and Resources

The following texts are recommended:

“Heating, Ventilating and Air Conditioning: Analysis and Design, 6th Edition” by F.C. McQuiston, D. Parker and J.D. Spitler

Unit Schedule

Refer to ilearn page for unit schedule

Lectures: Weeks 1-13

Practicals: Weeks 2-13

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies](https://students.mq.edu.au/support/study/policies) (<https://students.mq.edu.au/support/study/policies>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Academic Success

[Academic Success](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Ask a Study Coach](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)

- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the [Service Connect Portal](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit <https://students.mq.edu.au/support/technology/service-desk>.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Engineers Australia Competency Mapping

EA Competency Standard		Unit Learning Outcomes
Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	ULO1:100%
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	ULO2:50%
	1.3 In-depth understanding of specialist bodies of knowledge	ULO2:50% ULO3:33%
	1.4 Discernment of knowledge development and research directions	
	1.5 Knowledge of engineering design practice	
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	ULO3:33%
	2.2 Fluent application of engineering techniques, tools and resources.	
	2.3 Application of systematic engineering synthesis and design processes.	
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	ULO3:34%

Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	
	3.2 Effective oral and written communication in professional and lay domains.	ULO4:50%
	3.3 Creative, innovative and pro-active demeanour.	
	3.4 Professional use and management of information.	
	3.5 Orderly management of self, and professional conduct.	
	3.6 Effective team membership and team leadership	ULO4:50%

Unit information based on version 2026.02 of the [Handbook](#)