



# MECH402

## Energy Sustainable Design

S2 Day 2018

*Dept of Engineering*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Dr Ann Lee

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Room 132 Level 1, 44 Waterloo Rd, Macquarie Park

Consultation hours: By Appointment

Credit points

3

Prerequisites

MECH301 and MECH302

Corequisites

Co-badged status

Unit description

The students will learn about energy sustainable design processes, energy efficiency, heating, ventilation and air-conditioning systems design; Psychrometric Analysis, heating and cooling load calculations; air-conditioning equipment selection; duct design methods; concept of refrigeration and its applications; refrigeration cycles; refrigeration compressors, condensers, evaporators, expansion devices; vapour compression system design and analysis.

## 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:

The students will develop comprehensive understanding of energy sustainable design processes

The students will be able to apply their prior knowledge of thermodynamics and heat transfer, analytical and strategic thinking to design real world engineering systems.

The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.

The students will develop specific skills of project management, employment-related

teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## General Assessment Information

Student must achieve at least a 50% aggregate grade and meet the hurdle requirement 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.

### Assignment Tasks and Group Project

Assignment Problems will be posted on iLearn at least two weeks before their submission date. Assignment solutions will be demonstrated by the tutor within a week after the submission date in the tutorial class. Submissions will not be accepted once the solution is given.

All assignments must be submitted electronically through iLearn (in pdf format). Submissions are expected to be typed set in a logical layout and sequence. Markers WILL NOT grade poorly organised or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams.

Group project must be submitted in a group report format with the percentage indication of individual contribution.

In the event that an assessment task/group project is submitted late, the following penalties will apply; 0 to 24 hours -25%, 24 hours to 48 hours -50%, greater than 48 hours will result in no mark being awarded.

### Hurdle Requirement

The final examination is a hurdle requirement because it is the only reliable assessment of individual performance for this unit. A passing grade of 50% or more in the final examination is a condition of passing this unit. Students who make a serious attempt but fail to meet the hurdle requirement will be given one further opportunity to pass. A serious attempt is defined as achievement of a mark of 40% or greater.

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
<u>Assignments</u>	20%	No	Week 3, 5, 9, and 11
<u>Mid term test</u>	20%	No	Week 7
<u>Group Project</u>	20%	No	Week 12
<u>Final Exam</u>	40%	Yes	During exam period

### Assignments

Due: **Week 3, 5, 9, and 11**

Weighting: **20%**

4 Assignments x 5 marks each

Four individual assignments will test the student's understanding of the course material taught up to the point each assignment is distributed. The student is expected to solve problems which test both the concepts taught as well as the technical capabilities of the students in doing energy sustainable design. These assignments must be completed individually.

On successful completion you will be able to:

- The students will develop comprehensive understanding of energy sustainable design processes
- The students will be able to apply their prior knowledge of thermodynamics and heat transfer, analytical and strategic thinking to design real world engineering systems.
- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

### Mid term test

Due: **Week 7**

Weighting: **20%**

An in-class 1hr test assessing material delivered between weeks 1 and 6. To be conducted during lecture hours in lecture room.

On successful completion you will be able to:

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- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## Group Project

Due: **Week 12**

Weighting: **20%**

Students will be divided to a group of 5. Each group will be given a topic and required to perform heating/cooling load calculation and design in group report format.

Assessment marks includes:

- Individual contribution
- Final project mark

On successful completion you will be able to:

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- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## Final Exam

Due: **During exam period**

Weighting: **40%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Final examination assessing all material delivered throughout the course

On successful completion you will be able to:

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- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## 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

Week	Topic	Lecturer	Laboratory/Tutorial	Assessments
1	Energy sustainable design processes, energy efficiency	Dr. Lee	No tutorial	
2	Concept of refrigeration and its applications; refrigeration cycles	Dr. Lee	Refrigeration cycles	
3	Refrigeration compressors, condensers, evaporators, expansion devices	Dr. Lee	Refrigeration cycles	Assignment 1 due

4	Vapour compression system design and analysis	Dr. Lee	Vapour compression cycles	
5	Psychrometric Analysis heating and cooling load calculations	Dr. Lee	Vapour compression cycles	Assignment 2 due
6	Psychrometric Analysis heating and cooling load calculations	Dr. Lee	Applied Psychrometrics	
7	Midterm Examination during lecture hours	Dr. Lee	No tutorial	
8	Psychrometric Analysis heating and cooling load calculations	Dr. Lee	Applied Psychrometrics	
9	Heating, ventilation and air-conditioning systems design process	Dr. Lee	Commercial package for HVAC simulation	Assignment 3 due
10	Air-conditioning equipment selection; duct design methods;	Dr. Lee	Air Duct tutorial	
11	Sustainable buildings, materials, resource efficiency, fire safety	Dr. Lee	Group Project	Assignment 4 due
12	Guest speaker	Dr. Lee	Group Project	Group Project due
13	Revision	Dr. Lee	Revision	

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

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

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

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

## Results

Results shown in *iLearn*, 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 [ask.mq.edu.au](http://ask.mq.edu.au).

## Student Support

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

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)



## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

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.

## Graduate Capabilities

### Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

#### Learning outcomes

- The students will develop comprehensive understanding of energy sustainable design processes
- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

#### Assessment tasks

- Assignments
- Mid term test
- Group Project
- Final Exam

### Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

## Learning outcomes

- The students will be able to apply their prior knowledge of thermodynamics and heat transfer, analytical and strategic thinking to design real world engineering systems.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## Assessment tasks

- Assignments
- Mid term test
- Group Project
- Final Exam

## Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

## Learning outcomes

- The students will develop comprehensive understanding of energy sustainable design processes
- The students will be able to apply their prior knowledge of thermodynamics and heat transfer, analytical and strategic thinking to design real world engineering systems.
- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## Assessment tasks

- Assignments
- Mid term test
- Group Project
- Final Exam

## Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

### Learning outcomes

- The students will develop comprehensive understanding of energy sustainable design processes
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### Assessment tasks

- Assignments
- Mid term test
- Group Project
- Final Exam

## Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

### Learning outcomes

- The students will develop comprehensive understanding of energy sustainable design processes
- The students will be able to apply their prior knowledge of thermodynamics and heat transfer, analytical and strategic thinking to design real world engineering systems.
- The students will be able to analyse refrigeration and air-conditioning cycles and apply

their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.

## **Assessment tasks**

- Assignments
- Mid term test
- Group Project
- Final Exam

## **Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

## **Learning outcomes**

- The students will develop comprehensive understanding of energy sustainable design processes
- The students will be able to apply their prior knowledge of thermodynamics and heat transfer, analytical and strategic thinking to design real world engineering systems.
- The students will be able to analyse refrigeration and air-conditioning cycles and apply their acquired knowledge to improve the design and optimize the operating parameters of existing cycle.
- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

## **Assessment tasks**

- Assignments
- Mid term test
- Group Project
- Final Exam

## **Effective Communication**

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess,

write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

### **Learning outcome**

- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

### **Assessment tasks**

- Assignments
- Mid term test
- Group Project
- Final Exam

## **Engaged and Ethical Local and Global citizens**

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

### **Learning outcome**

- The students will develop specific skills of project management, employment-related teamwork and will be able to demonstrate professional dispositions and an ethical stance.

### **Assessment tasks**

- Assignments
- Mid term test
- Group Project
- Final Exam