MECH4002

Energy Sustainable Design

Session 2, Special circumstance 2020

School of Engineering

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and ot her small group learning activities on campus for the second half-year, while keeping an online ver sion available for those students unable to return or those who choose to continue their studies onli ne.

To check the availability of face-to-face and onlin e activities for your unit, please go to timetable vi ewer. To check detailed information on unit asses sments visit your unit's iLearn space or consult yo ur unit convenor.

General Information

Unit convenor and teaching staff
Convenor
Dr Ann Lee
ann.lee@mq.edu.au
Contact via Email
Room 132 Level 1, 44 Waterloo Rd, Macquarie Park
Consultation hours: By Appointment

Credit points
10

Prerequisites
((MECH3001 or MECH301) and (MECH3002 or MECH302)) or admission to MEngMechEng

Corequisites

Co-badged status

Unit description
This unit examines energy sustainable design processes, energy efficiency, heating, ventilation and air-conditioning systems design. The unit also covers knowledge in psychrometric analysis, heating and cooling load calculations, air-conditioning equipment selection, duct design methods, concepts of refrigeration and its applications, refrigeration cycles, refrigeration compressors, condensers, evaporators, expansion devices, vapour compression system design and analysis. At the end of the unit, students are expected to demonstrate a thorough and detailed understanding of the design of highly efficient heating ventilation and airconditioning (HVAC) systems.

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: Demonstrate comprehensive knowledge of energy sustainable design processes

ULO2: Demonstrate clear analytical and critical thinking ability in the design of real-world HVAC systems by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer.

ULO3: Analyse refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.

ULO4: Demonstrate specific skills in project management, teamwork and transformative capabilities relevant to enhance employability including the demonstration of professional dispositions such as 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
Group Project	20%	No	Week 12 Friday 5pm
Assignments	20%	No	Week 4 and 9 Friday 5pm
Midterm Examination	20%	No	Week 7 during lecture hours
Final examination	40%	Yes	Examination Week

Group Project

Assessment Type [1]: Project
Indicative Time on Task [2]: 30 hours
Due: **Week 12 Friday 5pm**
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.

On successful completion you will be able to:

- Demonstrate comprehensive knowledge of energy sustainable design processes
- Demonstrate clear analytical and critical thinking ability in the design of real-world HVAC systems by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer.
- Analyse refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Demonstrate specific skills in project management, teamwork and transformative capabilities relevant to enhance employability including the demonstration of professional dispositions such as ethical stance.

Assignments

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 30 hours
Due: **Week 4 and 9 Friday 5pm**
Weighting: **20%**

Two 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:

- Demonstrate comprehensive knowledge of energy sustainable design processes
- Demonstrate clear analytical and critical thinking ability in the design of real-world HVAC systems by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer.
- Analyse refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Demonstrate specific skills in project management, teamwork and transformative capabilities relevant to enhance employability including the demonstration of professional dispositions such as ethical stance.

Midterm Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 1 hours
Due: **Week 7 during lecture hours**
Weighting: **20%**

A 1-hour test assessing material delivered between weeks 1 and 6.

On successful completion you will be able to:

- Demonstrate comprehensive knowledge of energy sustainable design processes
- Demonstrate clear analytical and critical thinking ability in the design of real-world HVAC systems by applying integrative knowledge in the field of fluid mechanics,

thermodynamics and heat transfer.
- Analyse refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Demonstrate specific skills in project management, teamwork and transformative capabilities relevant to enhance employability including the demonstration of professional dispositions such as ethical stance.

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 3 hours
Due: **Examination Week**
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:
- Demonstrate comprehensive knowledge of energy sustainable design processes
- Demonstrate clear analytical and critical thinking ability in the design of real-world HVAC systems by applying integrative knowledge in the field of fluid mechanics, thermodynamics and heat transfer.
- Analyse refrigeration and air-conditioning cycles and apply critical knowledge to improve the design and optimization of HVAC systems performances.
- Demonstrate specific skills in project management, teamwork and transformative capabilities relevant to enhance employability including the demonstration of professional dispositions such as ethical stance.

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[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
- the Writing Centre 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

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	
4	Vapour compression system design and analysis	Dr. Lee	Vapour compression cycles	Assignment 1 due
5	Psychrometric Analysis heating and cooling load calculations	Dr. Lee	Vapour compression cycles	
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	Applied Psychrometrics	Assignment 2 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	
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). 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.)*

Students seeking more policy resources can visit the 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 (https://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 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 ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@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) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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

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

If you are a Global MBA student contact globalmba.support@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/.

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.

Changes from Previous Offering

In S2 2020 offering, both lecture and tutorial are delivered online.