



## UNSW Course Outline

# SOLA5057 Energy Efficiency - 2024

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## General Course Information

**Course Code :** SOLA5057

**Year :** 2024

**Term :** Term 2

**Teaching Period :** T2

**Is a multi-term course? :** No

**Faculty :** Faculty of Engineering

**Academic Unit :** School of Photovoltaic and Renewable Engineering

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Postgraduate, Undergraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

If Australia and the world are to reduce emissions of greenhouse gases, both renewable energy and more efficient use of that energy will be required. Energy efficiency is the cheapest, fastest, safest and simplest way to reduce emissions. This course covers the various methodologies, technologies and policies that can be used to reduce energy use, while still producing what that

energy is needed for - heat, light and movement. Topics covered include current and predicted energy use and associated GHG emissions; residential and commercial passive solar design; energy management programs; building management systems; heating, ventilation and air conditioning; and consumer products and office equipment. The impacts of transport are also covered, together with opportunities to reduce transport energy requirements through more efficient engines, public transport, and urban design. Industrial systems examined include heat recovery; cogeneration; compressed air and steam distribution; and motor systems, pumps and fans. Efficient use of water, and increased efficiency of water supply can also significantly reduce energy use. Various government policy measures at the local, state, commonwealth and international level are covered in terms of their effectiveness and relevance in Australia. Finally, barriers to improved energy efficiency such as up-front cost, lack of information, and the low cost of energy in Australia are examined. Assignments focus on energy use and emissions produced at your home and by your transport to and from the UNSW, and will also analyse current energy practices at the UNSW.

## Course Aims

The emphasis in this course is on a "whole of system" engineering approach to end use energy. Traditional

engineering focuses on small components of a total system. Opportunities to use energy most efficiently are

possible only once the whole system is considered. This approach can allow much larger energy reductions

of end use energy consumption to be achieved (in some cases as much as 95 per cent energy reductions can be

achieved whilst still delivering the same service). Assignments based on energy audits allow students to gain experience of

how to reduce energy consumption. Analysis of energy system will focus on understanding the basic physical

processes involved, identifying and quantifying the minimum energy requirements of energy consuming

processes.

# Course Learning Outcomes

Course Learning Outcomes
CLO1 : Explain the principles of energy efficiency, the contexts to which these apply and the importance of a systems level approach to reducing overall energy consumption.
CLO2 : Carry out cost analysis and comparison of the introduction of a new energy efficiency measure and assess its economic viability.
CLO3 : Carry out effective energy audits and demonstrate the importance of an energy systems approach.
CLO4 : Communicate the results of such audits and analyses.

Course Learning Outcomes	Assessment Item
CLO1 : Explain the principles of energy efficiency, the contexts to which these apply and the importance of a systems level approach to reducing overall energy consumption.	<ul style="list-style-type: none"><li>• Assignment 1 and 2</li><li>• Lab work</li><li>• Quizzes</li><li>• Final Exam</li></ul>
CLO2 : Carry out cost analysis and comparison of the introduction of a new energy efficiency measure and assess its economic viability.	<ul style="list-style-type: none"><li>• Assignment 1 and 2</li><li>• Lab work</li><li>• Quizzes</li><li>• Final Exam</li></ul>
CLO3 : Carry out effective energy audits and demonstrate the importance of an energy systems approach.	<ul style="list-style-type: none"><li>• Assignment 1 and 2</li><li>• Lab work</li><li>• Final Exam</li></ul>
CLO4 : Communicate the results of such audits and analyses.	<ul style="list-style-type: none"><li>• Assignment 1 and 2</li><li>• Lab work</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System

## Other Professional Outcomes

<https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>

This course is designed to address the learning outcomes listed in the link above and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown.

# Assessments

## Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 and 2 Assessment Format: Individual	40%	
Lab work Assessment Format: Individual	12%	
Quizzes Assessment Format: Individual	8%	
Final Exam Assessment Format: Individual	40%	

## Assessment Details

### Assignment 1 and 2

#### Assessment Overview

Two assignments:

Assignment 1 Energy Audit 20%

Assignment 2 Co-generation 20%

#### Course Learning Outcomes

- CL01 : Explain the principles of energy efficiency, the contexts to which these apply and the importance of a systems level approach to reducing overall energy consumption.
- CL02 : Carry out cost analysis and comparison of the introduction of a new energy efficiency measure and assess its economic viability.
- CL03 : Carry out effective energy audits and demonstrate the importance of an energy systems approach.
- CL04 : Communicate the results of such audits and analyses.

### Lab work

#### Assessment Overview

Labs on power factor correction and variable speed drives

#### Course Learning Outcomes

- CL01 : Explain the principles of energy efficiency, the contexts to which these apply and the importance of a systems level approach to reducing overall energy consumption.
- CL02 : Carry out cost analysis and comparison of the introduction of a new energy efficiency measure and assess its economic viability.

- CL03 : Carry out effective energy audits and demonstrate the importance of an energy systems approach.
- CL04 : Communicate the results of such audits and analyses.

## Quizzes

### Course Learning Outcomes

- CL01 : Explain the principles of energy efficiency, the contexts to which these apply and the importance of a systems level approach to reducing overall energy consumption.
- CL02 : Carry out cost analysis and comparison of the introduction of a new energy efficiency measure and assess its economic viability.

## Final Exam

### Assessment Overview

Final Exam Individual

### Course Learning Outcomes

- CL01 : Explain the principles of energy efficiency, the contexts to which these apply and the importance of a systems level approach to reducing overall energy consumption.
- CL02 : Carry out cost analysis and comparison of the introduction of a new energy efficiency measure and assess its economic viability.
- CL03 : Carry out effective energy audits and demonstrate the importance of an energy systems approach.

### Assessment Length

2 hours

## General Assessment Information

**Class participation** - Class and workshop attendance is expected. It is expected that you will attend all lecture and workshop sessions and participate in the project activities - class polls, quizzes etc. The guest lecture content may be assessed in the exam and/or the online quizzes.

**Presentation** - 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** - 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

[Examinations](#) - You must be available for all quizzes, tests and examinations. Final examinations for each course are held during the University examination periods: August for T2 2024. Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the [Exams](#) webpage.

#### Grading Basis

Standard

## Course Schedule

### Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

### General Schedule Information

The course consists of 3 hours of lectures (1 x 2 hour + 1 x 1 hour) and a 2 hour workshop session each week as listed below. NOTE Lectures will run from week 1 until week 10 (with no lectures in week 6, flexible study week). Workshops will run from week 2 until week 10 (with no workshop in week 6, flexible study week). There will be a laboratory session that you will need to enrol in, details will be given in class.

The course schedule will be posted in Moodle and given in lectures. Course structure is subject to small changes during the term. In particular, the projects and guest lectures in italics may move weeks and change slightly in content or presenter.

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

Workshops will cover material from the previous week's activities.

## Course Resources

### Recommended Resources

#### Reference Books

- Energy Efficiency Manual: for everyone who uses energy, pays for utilities, designs and builds, is interested in energy conservation and the environment by Donald R. Wulfinhoff
- Energy Management Handbook (8th Edition) by Wayne C. Turner and Steve Doty Both are available online via UNSW Library.
- Heat Transfer: A Practical Approach by Yunus A. Cengel

- Thermodynamics: An Engineering Approach by Yunus A. Cengel, Michael A. Boles.
- Fluid Mechanics - Fundamentals and Applications by Yunus A. Cengel and John M. Cimbala
- Factor Five: Transforming the Global Economy through 80% Improvements in Resource Productivity, Ernst von Weizsäcker, Karlson 'Charlie' Hargroves, Michael H. Smith, Cheryl Desha and Peter Stasinopoulos
- Factor 4: Doubling Wealth - Halving Resource Use by E. Weizaecker, A. Lovins and L.H. Lovins
- Natural Capitalism - Creating the Next Industrial Revolution by P. Hawken, A. Lovins and L.H. Lovins
- Cents and Sustainability Securing Our Common Future by Decoupling Economic Growth from Environmental Pressures, Michael H. Smith, Karlson 'Charlie' Hargroves and Cheryl Desha
- Rocky Mountain Institute: <http://www.rmi.org/>
- AS/NZS 3598:2014 Australian/New Zealand Standard<sup>a</sup> Energy audits (currently under revision) - Access via UNSW Library website

#### On-line Resources

- Stanford Energy Lectures by Amory Lovins, (2009) <https://www.youtube.com/watch?v=O5txQIEI7bc&t=1596s>
- Factor 10- Engineering: <https://www.rmi.org/our-work/areas-of-innovation/office-chief-scientist/10xe-factor-ten-engineering/>
- Alliance to Save Energy (USA) <http://www.ase.org/>
- Energy Efficiency Council (Australia) <http://www.eec.org.au/>
- Winning the Carbon War, Jeremy Leggett (2017) <https://jeremyleggett.net/the-carbon-war/>
- American Council for an Energy Efficient Economy <http://aceee.org/>
- German Initiative for Energy Efficiency (Deutschen Unternehmensinitiative Energieeffizienz) <http://www.deneff.org/>
- Energy Savings Trust (UK) <http://www.energysavingtrust.org.uk/>
- California Energy Commission <http://www.energy.ca.gov/>

UNSW Library website: <https://www.library.unsw.edu.au/>

#### Moodle

As a part of the teaching component, Moodle will be used to disseminate teaching materials. Assessment marks will also be made available via Moodle:

<https://moodle.telt.unsw.edu.au/login/index.php>.

#### Announcements and Discussion Forum

Announcements concerning course information will be given in the lectures and/or on Moodle. A Discussion Forum will also be established on the Moodle course page for you to post questions or initiate course-related discussions

# Course Evaluation and Development

We are always keen to hear your thoughts on the course and how it might be improved. You can give feedback throughout and, of course, through the MyExperience survey.

## Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Stephen Brenner		Room 217 TETB		Please contact via email	No	Yes
Teaching assistant	Jingnan Tong					No	No

## Other Useful Information

### Academic Information

#### I. Special consideration and supplementary assessment

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, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, 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](#).

#### II. Administrative matters and links

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](#)
- [Equitable Learning Services](#)

### III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

### IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: <https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>.

*Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.*

### 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](https://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.

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 or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

[www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

## Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) 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. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be 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 will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

## Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, 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

## **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)

## **School-specific Information**

### **SPREE Student Information Hub**

Students are welcome to visit the [SPREE Student Information Hub](#) for information such as sample study plans, course outlines, thesis project, industrial training etc.

## **School Contact Information**

For course-related matters, please contact course convenor directly via emails. Please email [spreeteaching@unsw.edu.au](mailto:spreeteaching@unsw.edu.au) for any other matters.