



UNSW
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Never Stand Still

Engineering

Mechanical and Manufacturing Engineering

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Summary of the Course

This course introduces the fundamentals of how the design and operation of automobile engines affect the performance and emissions. The fluid flow, thermodynamics, combustion, and fuel properties are studied with reference to engine power, efficiency, and pollutants formation. Students examine the design features and operating characteristics of different types of automobile engines including petrol engines and diesel engines, as well as the next-generation combustion engines including homogeneous-charge compression-ignition (HCCI) and gasoline compression ignition (GCI) engines. The key features of alternative fuels (including biofuels), hybrid, fuel cell, and electricity powered engines are also discussed. The course includes a lab for the engine performance test, a demonstration of the engine control unit mapping, and a term project of literature review performed by a group of students.

Aims of the Course

This course aims to improve understanding of the automobile engines and their operation and to use them to experience how materials on fluid mechanics, thermodynamics, and heat transfer studied in previous years integrates into a total engineering concept. The course also aims to advance student's problem solving skills such that the basics learned from the course can be used to deal with the real research and engineering challenges.

Student learning outcomes

This course is designed to address the below learning outcomes and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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

Learning Outcome		EA Stage 1 Competencies
1.	identify advantages and disadvantages of the operation and efficiency of automobile engines of all types;	PE1.5, PE2.3, PE3.3
2.	describe the key pollutants associated with combustion in engines and explain their significance with respect to health and the environment;	PE1.6, PE3.1, PE2.2
3.	perform basic calculations relating to the performance and emissions of automobile engines and analyse engine performance chart.	PE1.1, PE1.3, PE2.1
4.	provide technical explanations to the opportunities and limitations of alternative fuel engines, hybrid engines, and electricity powered engines.	PE3.2, PE3.4, PE3.6

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For the lectures, students are highly encouraged to study the given topics before they attend the class. The suggested readings and the lecture notes uploaded prior to the class are minimum requirements. Students should keep an eye on the latest news and journal articles regarding the engine technologies and try to relate those to the topics taught in the lecture. Refer to section 6 students resources.

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Lecture schedule

Week

Topics

Suggested Readings

Demonstration schedule

Week	Demonstration	Term Project
2	Homework #1 released	Term project outline released
3	Homework #1 due Homework #2 released	Build a team of 5 students Report a selected topic

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Assignments

Presentation

All submissions should follow the instructions provided to each assignment.

All submissions are expected to be completed by the due date.

8. c c h o r

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: 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

Further information on School policy and procedures in the event of plagiarism is available on the [intranet](#).

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All students are expected to read and be familiar with School guidelines and policies, available on the intranet. In particular, students should be familiar with the following:

- x [Attendance, Participation and Class Etiquette](#)
- x [UNSW Email Address](#)
- x [Computing Facilities](#)
- x [Assessment Matters](#) (including guidelines for assignments, exams and special consideration)

- x [Academic Honesty and Plagiarism](#)
- x [Student Equity and Disabilities Unit](#)
- x [Health and Safety](#)
- x [Student Support Services](#)

Associate Professor Shawn Kook
5 Feb 2016

