



# *UTS:ENGINEERING*

## 49307: INTERNAL COMBUSTION ENGINES

### SUBJECT OUTLINE

<b>Subject Number:</b>	49307
<b>Credit Points:</b>	6
<b>Subject Coordinator:</b>	Guang Hong
<b>Semester/Year:</b>	Spring 2007
<b>Prerequisites:</b>	48651 Thermodynamics Or equivalent

This subject outline contains information you will need to find your way around the subject. It attempts to provide a structure for your learning, giving details of the topics, and how, when and where you can choose to study them. .

This subject outline should be read in conjunction with the relevant Faculty of Engineering Student Guide which contains information which is relevant to all Faculty of Engineering subjects. This Student Guide will contain additional relevant information.

The information in this subject outline was correct at the time of printing.

## Subject Definition

The following information is drawn from the official definition of the subject which has been approved by the Faculty Board of Engineering. It will typically remain the same from semester to semester, except where variations are approved by the Faculty Board.

## Subject Aims

- To develop fundamental understanding of internal combustion engines;
- To be able to understand the new engine technologies;
- To prepare for applications of learnt knowledge in engineering practice;
- To increase an awareness and emphasis on energy resources and environmental issues.

## Summary of material to be covered

- Engine structure and operating cycles;
- Important engine characteristics and evaluation of performance;
- Fuel preparation and fuelling systems for diesel engines;
- IC engine combustion and formation of emissions;
- Emissions measurement, control & regulations;
- Engine knock;
- Supercharging and turbocharging;
- Application of computational fluid dynamics to IC engines;
- Alternative fuels;
- Engine electronic control;
- Recent engine development.

## Learning Outcomes

On successful completion of this subject, students should understand

- 1) fundamental principles which govern internal combustion (IC) engine design and operation;
- 2) the combustion process and emission formation;
- 3) alternative fuels and associated problems to be solved;
- 4) measurement of control of engine emission pollution;
- 5) electronic fuel injection; and
- 6) current issues of environment and energy resources related to IC engines.

## Subject Overview

The following information is the detailed overview of the subject: including general information about the subject structure, delivery and staffing

### Subject organisation and what we expect of you

This subject includes 3.0 hours lecture time per week. The 3.0 hours will be spent on lecturing and tutoring alternately, depending on the contents covered in each week and aiming to maximize the effectiveness of students' learning. In general the percentage of class time on lecturing will be 70 % and tutoring 30%. Two one-hour consultations will be arranged weekly to assist students' self-study outside class time. Assignments and laboratory will be arranged to consolidate students' learning.

As a student in this subject you are expected to help keep a good order in the lecture room. You are also expected to well organise your time, and participate actively in team work.

### Staff

SUBJECT COORDINATOR AND LECTURER	PHONE	EMAIL	OFFICE / CONSULTATION
Dr. Guang HONG	02 9514 2678	<a href="mailto:guang.hong@uts.edu.au">guang.hong@uts.edu.au</a>	Building 2, Level 6, Room 628, Consultation Times: Monday: 4:00pm – 5:00pm Wednesday: 4:00pm – 5:00pm

GUEST LECTURER	PHONE	EMAIL	OFFICE / CONSULTATION
Prof. Brian Milton			UNSW

TECHNICAL STAFF	PHONE	EMAIL	OFFICE / CONSULTATION
Mr. Chris Chapman			Building 2, Level 3, Room 319.

### Contacting staff

If you wish to discuss your questions or need further help with understanding concepts in the subject, please see the lecturer during consultation hours. If you are unable to come then, please try other times when the lecturer is available. Email and phone messages will not be responded to, except for urgent matters. The following are contact details:

A/Prof. Guang Hong, Room CB02.6.19, Tel: 9514 2677, E-mail: [guang.hong@uts.edu.au](mailto:guang.hong@uts.edu.au)

## Subject timetable

**Time and location:** Monday 6:00pm-9:00pm, Room 533, Level 5, Building 2

WEEK	DATE	TOPIC	LECTURER	ASSESSMENT
1	30 July	Introduction to IC engines Ideal & actual cycles, Fundamentals	GH	
2	6 Aug.	Engine characteristics and evaluation of performance	GH	
3	13 Aug.	IC engine combustion & formation of emissions	GH	Assignment 1 due
4	20 Aug.	IC engine combustion & formation of emissions	GH	
5	27 Aug.	Engine testing and instrumentation	GH	Assignment 2 due
6	3 Sep.	<b>Laboratory</b> , Room 201, Engine Laboratory	GH, CC	
7	<b>10 Sep.</b>	Supercharging & turbocharging	GH	
8	17 Sep.	Fuel preparation and fuelling systems for diesel engines	BM	Assignment 3 due
9	1 Oct.	<i>Tutorial Week</i>		
10	8 Oct.	Fuel preparation and fuelling systems for gasoline engines	BM	
11	15 Oct.	Emissions regulations and measurements.	GH	Laboratory report due
12	22 Oct.	Engine knock, Alternative fuels	GH	Assignment 4 due
13	<b>29 Oct.</b>	Engine electronic control and management	GH	
14	7 Nov.	Revision	GH	

## Assessment

**IMPORTANT NOTE:** This should be read in conjunction with the information on assessment in both the student guide and in the UTS Coursework Assessment procedures and policy manual. The details of all aspects of assessment (including, but limited to, submission processes, late penalties, referencing, attendance, etc.) are governed by the details in these associated documents except where explicitly over-ridden by the following information.

## Assessment tasks

Laboratory:	30%
Assignments	30%
Examination (open book):	40%

## Minimum essential requirements for students

In order to pass the subject, you must earn an overall total of 50 marks or more for the subject; **and** receive 40% or more of the mark for the final examination.

## Assessment procedures and advice

Information on general Faculty policy about assessment procedures etc. is provided in the Faculty Student Guide. The following information is provided in addition to this, and covers any variations to the defaults in the course guide.

**Assignments:** hand written is permitted but required to be readable. Late assignments or laboratory reports will NOT be accepted.

**Laboratory report:** hand written is permitted for equations and calculations.

The report should meet the requirements specified in the laboratory instruction.

**Examinations:**

Final examination covers the topics in week 1-14 inclusive. It is an open book examination.

## Learning resources

### Learning guide

Provided separately

### References and Internet Sites

1. Heywood, John B., *Internal Combustion Engine Fundamentals*, McGraw-Hill, 1988.
2. Milton, Brain E., *Thermodynamics, Combustion and Engines*, Chapman & Hall, 1995.
3. Stone, R., *Introduction to Internal Combustion Engines*, 3rd ed., Macmillan, 1999.
4. Taylor, C.F., *The Internal Combustion Engine in Theory and Practice*, Vols 1 and 2, MIT Press Cambridge, 1985.
5. Heisler, Heinz, *Advanced Engine Technology*, E. Arnold, London, 1995.
6. Eastop, T.D. & McConkey, A., *Applied Thermodynamics, For Engineering Technologists*, 5th edition, Longman Scientific & Technical, 1993
7. Stan, Cornel, *Direct injection systems : the next decade in engine technology*, Warrendale, PA : Society of Automotive Engineers, 2002.

### UTS-Online

UTS-Online is an internet based teaching and learning tool. You will be provided a login name and need a password to access. Following is the website address:

<https://online.uts.edu.au/webapps/login/>

{END OF STANDARD SUBJECT INFORMATION}