



UNIVERSITAT
POLITÈCNICA
DE VALÈNCIA



LBG Valencia

Spring Course 2015:

Warm me up,
my engine is ready!

Syllabus



Course Overview

The course's objective is to give a short overview on different aspects of reciprocating internal combustion engines. The course is structured in the following units:

TOPIC	SESSIONS	LECTURER
1. ENGINE FUNDAMENTALS	CONCEPTS	JJ LOPEZ
	ENGINE TESTING	J MARTIN
2. AIR MANAGEMENT	FUNDAMENTALS	R NOVELLA
3. COMBUSTION	SI ENGINE	JM GARCIA-OLIVER
	CI ENGINE	A GARCIA
4. EMISSIONS	FUNDAMENTALS	JV PASTOR
	MEASURING EQUIPMENT	S MOLINA/JM PASTOR
5. ENGINE CONTROL	FUNDAMENTALS	B PLA

Alongside with the lectures, the course will additionally include a Case Study, an External Visit, Practical Laboratory Sessions and a Final Evaluation, all of which will be described more thoroughly in the following document.

Description of Academic Content

I. ENGINE FUNDAMENTALS	
Lecturer	JJ Lopez, J Martín
Number of working hours	3.0
Type of activity	Lecture + Lab exercise
Short summary of the content	The first unit is an introduction, with the definition of relevant engine nomenclature and classifications. Two activities will be carried out: <ul style="list-style-type: none">- A formal lecture with the explanations and definitions of the relevant concepts.- A lab exercise where students will learn about engine testing procedures.
Bibliography	Stone, R. Introduction to Internal Combustion Engines. MacMillan Publishers, Ltd., 1985. 2nd ed. 1992
Expected Effect	The students will set the basic concepts towards the understanding of the complete course

2. AIR MANAGEMENT	
Lecturer	R Novella
Number of working hours	1.5
Type of activity	Lecture
Short summary of the content	This unit will be devoted to the understanding of the fundamentals of air management: <ul style="list-style-type: none">- Quantitative parameters for air-breathing engine characterization- Factors affecting volumetric efficiency- Engine turbocharging- EGR
Bibliography	Watson, N., and M. S. Janota. Turbocharging the Internal Combustion Engine. New York: John Wiley & Sons, 1982.
Expected Effect	The students will understand and apply concepts regarding air management in modern I.C. engines.

3. COMBUSTION

Lecturer	JM García-Oliver, A García
Number of working hours	3.0
Type of activity	Lecture
Short summary of the content	<p>This unit will deal with the analysis of the combustion process in I.C. engines. Two lectures will be delivered, one on S.I. Engines and the other on C.I. Engines, focused on the following aspects:</p> <ul style="list-style-type: none">- Phenomenological description of the combustion process- Engine parameters affecting the combustion
Bibliography	https://www3.nd.edu/~msen/Teaching/DirStudies/Engines.pdf - Chapter 7: Combustion
Expected Effect	The students will study the underlying concepts of modern combustion applied to I.C. engines

4. EMISSIONS

Lecturer	JV Pastor, S Molina, JM Pastor
Number of working hours	3.0
Type of activity	Lecture + Lab exercise
Short summary of the content	<p>This unit will deal with the problems raised by exhaust emissions in I.C. engines. The work will be divided into two subsessions:</p> <ul style="list-style-type: none">- Lecture: fundamentals of emission formation and emission reduction strategies- Lab: Visit the CMT testing and research facilities with focus on exhaust gas measurement equipment
Bibliography	http://www.eolss.net/sample-chapters/c09/e4-14-05-01.pdf
Expected Effect	The students have an insight on contemporary emission formation and reduction strategies

5. ENGINE CONTROL

Lecturer	B Pla
Number of working hours	1.5
Type of activity	Lecture
Short summary of the content	<p>This unit will deal with the management of the main engine systems and processes, namely combustion and air management. The contents will be:</p> <ul style="list-style-type: none"> - Historical evolution of control in I.C. engines - Fundamentals of control concepts - Introductions to typical sensors and actuators. - Engine calibration process of advanced I.C. engines.
Bibliography	http://www.sae.org/students/presentations/ecus_and_engine_calibration_201_by_jeff_krummen.pdf
Expected Effect	The students will learn the fundamentals of modern engine control and explore on current developments.

6. CASE STUDY (I)

Lecturer	D Montalvo
Number of working hours	2.0
Type of activity	Case Study
Short summary of the content	<p>This unit will be devoted to a practical case study of real vehicle and stationary engines. Based on the comparison of different engine models groups will discuss similarities and differences.</p>
Bibliography	http://web.iitd.ac.in/~ravimr/courses/mel345/classification.pdf
Expected Effect	The students will understand the different application of modern I.C. engines.

7. COMPANY VISIT

Representative	M. Catalán
Number of working hours	3.0
Type of activity	Company Visit
Short summary of the content	This unit will be devoted to company visit to one of the most promising luxury car manufacturers in Spain - Spania GTA.
Bibliography	http://www.spaniagta.com/en/home
Expected Effect	The students will visit a top-tier company in the automobile sector and see their working methods.

8. EXTERNAL VISIT

Lecturer	Lucas Mestre
Number of working hours	3.0
Type of activity	Visit
Short summary of the content	This unit consist of a visit to our local Formula Student group. The activity will include a presentation of their team and working methods as well a visit of their workshop.
Bibliography	http://www.formulaupv.com/
Expected Effect	The students will visit a Formula Student group and will be able to see applied academical concepts.

9. EVALUATION

Lecturer	D Montalvo, R Novella
Number of working hours	4.5
Type of activity	Evaluation
Short summary of the content	The final unit will consist on an evaluation through and oral exposition by groups. Participants will have 3.0h to prepare the evaluation and all groups will present their prepared projects within 1.5h
Bibliography	None
Expected Effect	The students will put the knowledge they have learned throughout the course to test

Academic Schedule

		Tuesday 7th	Wednesday 8th	Thursday 9th	Friday 10th
8:00 - 8:30		Wake-up & Breakfast			
8:30 - 9:00					
9:00 - 9:30		Lecture 1 ENGINE FUNDAMENTALS	Lecture 4 COMBUSTION - CI ENGINE	Labs + CMT visit - ENGINE TESTING - EMISSION MEAS.	Preparation for Evaluation
9:30 - 10:00					
10:00 - 10:30					
10:30 - 11:00		Coffee Break			
11:00 - 11:30		Lecture 2 AIR MANAGEMENT	Lecture 5 EMISSION FORMATION	Labs + CMT visit - ENGINE TESTING - EMISSION MEAS.	Preparation for Evaluation
11:30 - 12:00					
12:00 - 12:30					
12:30 - 13:00		Coffee Break			
13:00 - 13:30		Lecture 3 COMBUSTION - SI ENGINE	Lecture 7 ENGINE CONTROL		Evaluation
13:30 - 14:00					
14:00 - 14:30					
14:30 - 15:00		Lunch			
15:00 - 15:30					
15:30 - 16:00		Case study (I)	Company Visit - Spania GTA	Company Visit - FSUPV	Closing
16:00 - 16:30					
16:30 - 17:00					
17:00 - 17:30					
17:30 - 18:00					
18:00 - 18:30					