UNIVERSITY of NICOSIA

Course Code	Course Title	ECTS Credits
MENG-430	Internal Combustion Engines	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-262, MENG-280
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Marios Alaeddine
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Provide students with easy-to-understand analyses of basic combustion concepts.
- Give an introduction of a wide variety of practical applications that motivate or relate to the various theoretical concepts of combustion.
- Provide students with an introduction to Internal Combustion (IC) engines.
- Present components and technologies used in IC engines.
- Students will gain an understanding of the fundamentals the design and operation of internal combustion and the factors governing engine design decisions affecting their performance & efficiency, fuelling strategies and environmental impact.
- Students will become knowledgeable in fluid flow, thermodynamics, combustion, heat transfer and friction phenomena and fuel properties relevant to engine power efficiency & emissions.

Learning Outcomes:

After completion of the course students are expected to:

- Describe main concepts within combustion theory.
- Understand the main characteristics of combustion chemistry, kinetics, and mechanisms
- Describe the main components of Internal Combustion engines.
- Apply engineering fundamentals to the analysis of IC engines.
- Demonstrate an understanding of the current engine technology and future trends.
- Perform analysis of internal combustion engine thermodynamic cycles.
- Determine basic engine performance parameters.
- Evaluate the influence of different design parameters and different technologies on engine performance.
- Be aware of issues relating to energy conversion and pollutant emissions in IC engines.

Course Contents:

- History of engines and modern developments, challenges facing internal combustion engines.
- Overview of Combustion
  - o Combustion and Thermochemistry
  - o Chemical Kinetics and Mechanisms
  - o Thermal Analyses of Reacting Systems
- Combustion and Flows
  - o Simplified Conservation Equations for Reacting Flows
  - o Laminar Premixed and Diffusion Flames
  - o Introduction to Turbulent Flows
  - o Turbulent Premixed and Nonpremixed Flames
- Burning
  - o Burning of Solids
  - o Droplet Evaporation and Burning
- Engine types and configurations.
- Review of fuel chemistry, emissions, engine performance metrics & characteristics
- Spark Ignition (SI) engines, operating principle, standard cycles, combustion in SI engines, emissions and emission control.
- Induction, exhaust processes, and heat transfer in ICE;
- Compression ignition engines, combustion in diesel engines, diesel engine emissions and emission control.
- Turbo/supercharging.
- Alternative engine cycles.
- Alternative fuels.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises, in-class activities, designing, videos.
The course format is 3 h lectures and 1 h design tutorial session per week.

Assessment Methods:

Homework, mid-term exam, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Richard Stone	Introduction to Internal Combustion Engines	Macmillan	2012	0768004950
Turns, Stephen	An Introduction to Combustion: Concepts and Applications	McGraw-Hill	2011	9780073380193

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Y.Cengel and M. Boyles	Thermodynamics : An Engineering Approach 7th Edition	McGraw-Hill	2010	007352932X