UNIVERSITY of NICOSIA

Course Code	Course Title	ECTS Credits
MENG-432	Automotive Engineering	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-280
Type of Course	**Field**	**Language of Instruction**
Elective	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Andreas Loizou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The purpose of the course is to give students an overview of all the main systems, subsystems and components that concern automobile vehicles. It also gives a theoretical knowledge on the calculation of parameters such as the engine horsepower, gear ratios and braking energy dissipation.

Learning Outcomes:

Upon completion the students should be able to:

- Understand the four stroke engine cycles and calculate engine performance parameters
- Understand the principle of operation of transmission systems and calculate the desirable gear ratios
- Calculate the braking energy absorption based on braking dynamics
- Describe steering geometries and principles
- Appreciate the functionalities of electronic and hybrid systems

Course Contents:

1. Introduction to Automotive Engineering
   - 1.1. Power Plants
   - 1.2. Transmission systems
   - 1.3. Braking systems
   - 1.4. Steering and Suspension systems
   - 1.5. Importance of electronic systems
2. Automotive Power Plats
   - 2.1. Four stoke cycle Otto and Diesel cycle
   - 2.2. Theoretical Pressure-Volume (P-V) diagrams (Otto and Diesel)
   - 2.3. Actual P-V diagrams (Otto and Diesel)
   - 2.4. Theoretical P-V diagrams (Otto and Diesel)
   - 2.5. Valve timing diagrams

2.6. Firing order
2.7. Compression ratio calculation
3. Power and efficiency
3.1. Engine power and efficiency
3.2. Typical power and torque curves
3.3. Specific fuel consumption
4. Transmission Systems
4.1. Clutch
4.1.1. Conventional
4.1.2. Spring and diaphragm loaded
4.1.3. Multi disc clutch
4.2. Gear box
4.2.1. Manual gear box principle of operation
4.2.2. Automatic planetary gear ratio calculation
4.2.3. Manual gear ratio calculation
4.2.4. Continuously variable transmission
4.3. Differentials
4.3.1. Purpose
4.3.2. Principle of operation
5. Braking
5.1. Braking energy absorption calculation
5.2. Braking dynamics
5.3. Braking systems configuration
5.4. Disc and drum brakes principle of operation
6. Steering and suspension
6.1. Ackermann steering geometry
6.2. Rack and pinion mechanism
6.3. Power steering
6.4. Suspension systems principles
7. Vehicle electronic systems
7.1. Typical Sensors and actuators
7.2. Instrumentation systems
7.3. Engine management systems
7.4. Vehicle management systems
8. Hybrid Systems
8.1. Principle of operation
8.2. Systems architecture
8.2.1. Systems in series
8.2.2. Systems in parallel
8.2.3. Advantages and disadvantages of each system
8.3. Batteries
8.4. Regenerative braking
8.5. High voltage wiring

Learning Activities and Teaching Methods:

Lectures, lab demonstrations, and homework assignments.

The course format is 2 h lectures and 1 h laboratory work per week.

Assessment Methods:

Coursework, midterm exam, final exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Richard Stone Jeffrey K. Ball	Automotive Engineering Fundamentals	SAE International	2004	0768009871
Tom Denton	Automobile Electrical and Electronic Systems	Routledge	2012	0080969429
Mehrdad Ehsani Yimin Gao Ali Emadi	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles	CRC Press	2009	1420053981