ANNEX 2 – COURSE DESCRIPTION

Course Title	**Electronic Management Systems**				
Course Code	**AU206**				
Course Type	**Compulsory**				
Level	**BSc (Level 1)**				
Year / Semester	**4th**				
Teacher's Name	**Julios Vasiliou**				
ECTS	5	Lectures / week	3	Laboratories/week	2
Course Purpose	**The course aim is to introduce students to the concept of Vehicle Internal Combustion Engines Management, basic considerations and terminology. Students should be able to recognize basic components, comprehend the fundamental background theory of vehicle ICE system management, and practical skills and attitudes on servicing and repairs of the vehicles ICE systems in the automotive laboratory.**				
Learning Outcomes	**By the end of the course, students must be able to:** • **Analyse of fuel emissions, their causes and how they can be reduced. Explanation of the need fuel economy and emission reduction.** • **Evaluate the effect of various control features on emissions and performance.** • **Explain the function of the catalytic converter efficiency and exhaust gas recirculation valves** • **Understand the principle of engine mapping and analyse of the parameters needed to write a base map and how to smooth it.** • **Analyse the frequency and deviation of the fuel controller and the function of the oxygen sensor.** • **Explain open and close loop systems and the conditions needed for each loop.** • **Explain the function and characteristics of various sensors and actuators associated with fuel control strategy** • **Analyse mechanical, transistorised and electronic ignition systems (Hall generator, induction type, pulse generator, semiconductor ignition, Knock control, distributor-less semiconductor ignition)**				
Prerequisites	**AU203**		Corequisites	**None**	
Course Content	• **Introduction to the Vehicle electronic engine control** - **Emissions and Fuel economy** - **Engine Mapping** - **Effect of various control features on performance** • **Electronic control Strategy of Fuel System**				

	- **Catalytic Converters and Oxygen sensor** - **Frequency and deviation of the fuel controller** - **Open and close loop control** ● **Electronic control Strategy of Ignition System** - **Electronic, mechanical and transistorized ignition (Hall generator, induction type, pulse generator, semiconductor ignition, Knock control, distributor-less semiconductor ignition)** - **Open and closed loop control** - **Spark plugs** ● **Various sensors and actuators** - **Fuel control sensors and actuators operation** - **Ignition timing control sensors and actuators operation** ● ***Laboratory Work:*** - Experiment 1: Transient and Steady State Emission Analysis Petrol engines - Experiment 2: Simulation of Lambda probe - Experiment 3: Simulation of Engine Temperature Sensor - Experiment 4: Simulation of Engine rpm and phase sensor - Experiment 5: Simulation of knock sensor - Experiment 6: Simulation of Throttle valve transducer and idle switch - Experiment 7: Simulation of Injector - Experiment 8: Simulation of Absolute pressure sensor - Experiment 9: Simulation of Ignition in Otto Cycle engine (Electronic Ignition) - Experiment 10: Simulation of Electronic Engine Operation (start and warming –up phase) - Experiment 11: Simulation of Electronic Engine Operation (Acceleration, deceleration, cut-off and knock phase) - Experiment 12: Use of oscilloscope on running engine to test various sensors and actuators
Teaching Methodology	**The taught part of course is delivered to the students by means of lectures, conducted with the help of computer presentations. Lecture notes and presentations are available through the e-learning platform for students to use in combination with the textbooks. Furthermore theoretical principles are explained by means of demonstration examples and solution of specific problems.** **Lectures are supplemented with laboratory work carried out with the supervision of a lab assistant. Students, in small groups, apply knowledge gained in class into development of practical skills in real vehicle components and simulation boards.**
Bibliography	**(a) <u>Textbooks:</u>** **William B. Ribbens ,"Understanding Automotive Electronics", 8th Edition, Newnes, 2017** **(b) <u>References:</u>** **Julian Edgar, "Car Electrical & Electronic Systems", Veloce, 2019** **Tom Denton, "Automobile Electrical and Electronic Systems", 5th Edition, Society of Automotive Engineers, 2017.**

	Tom Denton, "Automobile Mechanical and Electrical Systems", 2nd Edition, Routledge, 2017 **Bauer Horst, "Automotive Electrics and Electronics", Robert Bosch, 1999**
Assessment	**The assessment consists of following methods for both the theoretical and practical part of the course. Each assessment method is assigned with a weight, which is used for the calculation of the final grade.** **Mid-term exams: 30%** **Laboratory work: 20%** **Final Exam (written): 50%**
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