Course unit title:	Introduction to Vehicle Systems		
Course unit code:	AU211		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	2		
Semester when the unit is delivered:	3 (Fall)		
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Mr. Julios Vasiliou, Mr. Marios Sevastides		
Learning outcomes of the course unit:	1. Description of vehicle co-ordinate geometry and modelling. Analysis of various parameters that influence the suspension geometry. 2. Perform analysis in axle loading in various cases and be able to determine the centre of gravity of a vehicle in three dimensions 3. Apply calculation in power and traction limited acceleration models, comparing various driveline scenarios. 4. Description of various braking components and evaluation of optimum braking forces distribution to each axle. 5. Analyze the tire-road friction relationship 6. List and describe the various types of power motors available to vehicles 7. Evaluate the costs of direct and indirect pollution sources of a vehicle 8. Remember methodology and procedures for identifying and replacing faulty components in suspension, braking and steering systems. 9. Illustrate skills in using modern workshop equipment to identify faults in mechanical and electrical operation of systems 10. Analyze and evaluate proper procedures for handling hazardous components such as suspension springs and SRS systems. Develop safe working practices 11. Development of skills in suspension, steering and braking system maintenance, repair and rebuild.		
Mode of delivery:	Face-to-face		
Prerequisites:	AU110	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	● **Introduction to Vehicles Systems** - Driveline components - fundamental modelling of vehicles - axle loads - power limited acceleration - traction limited acceleration - Braking system components - braking forces and brake - tire-road friction - modelling of vehicles motion ● Introduction to Vehicle Power Units		

	- Otto and Diesel motors - hydrogen motors - electrical motors - hydraulic motors - hybrid motors • Introduction to Energy Resources and Environment: - energy resources and their limitations, the 3-liter car - pollution and pollution reduction - noise and noise reduction **Laboratory Work:** • **Suspension system:** Illustration of the types of suspension systems available in modern vehicle and the types of universal joints. Student should be able to check ball joints for play and bushings for wear. Using suitable equipment these parts must be replaced. Assembly/disassembly of Macpherson strut using spring compressor and checking strut mount bearing for wear. Inspection of dampers for leak and correct operation is carried. Checking springs for wear/ corrosion and determination of spring constant • **Steering:** Illustration of the types of steering systems available in modern vehicles together with the types of steering rods (tie rod) and ball joints. Students should be able to check all joints and bellows for wear and replace any faulty parts. Checking rack and pinion steering system for wear and play will be carried. The hydraulic system will be tested for proper operation and measurement of pump pressure will be carried. Also all hydraulic hoses and valves will be checked for leaks and cracks. Students will overhaul a rack and pinion power steering system changing seals and gaskets. Assembly and disassembly of steering column system. Introduction to SRS airbag systems found on steering wheels will also take place. • **Brakes:** Students must be able to replace disc brakes and brake pads. Introduction to electrically operated hand brakes (method of replacing brake pads). Replacement of brake shoes and drums and adjusting and cleaning drum brake systems. Also adjusting of mechanical and electronic handbrake systems. Inspection for ovality on discs and drums and methods of refacing. Overhauling of master, slave cylinders and brake callipers. Inspection of flexible hoses and brake lines for wear and/or corrosion. Measurement of brake pressure on both circuits and proportionating valve effectiveness. Inspection of brake booster and check valve for proper operation. Introduction to ABS and ESP systems • **Shafts:** Replacement of driveshaft bellows and driveshaft constant velocity joint. • **Steering Geometry:** Measurement and adjustment of Camber, Caster, Steering Axis Inclination and toe angle on static vehicle
Recommended and/or required reading:	
Textbooks:	J. Y. Wong, Theory of Ground Vehicles, Wiley-Interscience, 4th edition, 2008
References:	• Thomas D. Gillespie , Fundamentals of Vehicle Dynamics, SAE International, 1992 • William F. Milliken, et al, Chassis Design: Principles and Analysis, Society of Automotive Engineers, 2002. • Robert Bosch, Automotive Handbook, Robert Bosch GmbH, ISBN: 0837612438 • M J Nunney, Light and Heavy Vehicle Technology, Butterworth-Heinemann, 2006 • Hans Pacejka, Tire and Vehicle Dynamics, SAE International, 2005

Planned learning activities and teaching methods:	The course is taught in class with the aid of computer presentations. Details lecture notes and presentations as well as any other relevant supporting material (graphs, figures, etc.) are available through the lecturer's website for the students to use in conjunction with the textbooks. Laboratories are carried in the Automotive Laboratory, in small groups, in order for the students to develop understating of the taught material.
Assessment methods and criteria:	• Assignments 10% • Tests 20% • Laboratory Work 20% • Final Exam 50%
Language of instruction:	English
Work placement(s):	No