Course unit title:	Vehicle Structures		
Course unit code:	AU 403		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	4		
Semester when the unit is delivered:	7 (Fall)		
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Dr.-Ing. Loucas Papadakis		
Learning outcomes of the course unit:	1. Perform analyses of vehicle structures by applying modelling techniques, i.e. the shear panel method. 2. Apply calculation software for analysing main vehicle structure components and apply loads and determine support constraints. 3. Identify and compare different vehicle structure types. 4. Relate different structural components to corresponding treatment method for their manufacture and compare to their structural properties. 5. Apply analytical methods for the design of vehicle structures and assemblies. 6. Evaluate and explain the structural behaviour under loading. 7. Design and construct main vehicle structure groups (structural component analysis) satisfying loads and security factors. 8. Summarize and defend the proposed design and critically appraise problematic regions.		
Mode of delivery:	Face-to-face		
Prerequisites:	AU 308	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	● **Linear elasticity application to vehicle structures:** Compute the dynamic load factor, know the safety factor and the basic global load cases, list the most common vehicle structure types. ● **Fundamental vehicle loads** and their estimation. ● **Simple structural surface method** for the description of total vehicle shells. ● **Vehicle body materials:** behaviour of metallic beams of prismatic and circular sections loaded longitudinally and laterally. ● **Behaviour of circular, rectangular and corrugated plate** under bending loads. ● **Behaviour of composite materials** under in plane and bending loads. ● **Basic failure modes:** yield criteria, fracture strength, fatigue and creep. ● **Manufacturing processes for the vehicle structures production**: basic principles of forming (deep-drawing, hot-forming), casting, extrusion moulding. ● **Joining processes in body-in-white:** riveting, welding, adhesive bonding etc and structural analysis at joints. ● **Advantages of manufacturing processes** for achieving high structural properties and reduction of mass.		

	• **Vehicle overall structural design:** analytical calculation of joined structures, and performance of vehicle structural component analysis. • **Modelling vehicle structures using industrial software:** Solid Works, LSDYNA and ANSYS.
Recommended and/or required reading:	
Textbooks:	J. Happian-Smith, ***An Introduction to Modern Vehicle Design***, Butterworth Heinemann, 2001 J. Brown, A Robertson, J. Serpento, T Stan, ***Motor Vehicle Structures: Concepts and Fundamentals***, Oxford:Butterworth, 2002 H. J. Beerman, ***Analysis of Commercial Vehicle Structures***, London: Mech. Eng. Pub., 1989 J. Pawlowski, ***Vehicle Body Engineering***, Business Books Limited, 1969
References:	G. Davies, ***Materials for Automotive Bodies***, Elsevier, 2012 M. A. Omar, ***The Automotive Body Manufacturing Systems and Processes,*** Wiley 2011 S. P. Timoshenko and S. Woinowsky-Krieger, ***Theory of Plates and Shells,*** McGraw-Hill International Editions, 1959. J. Maxwell, ***Plastics in the Automotive Industry***, Woodhead Publishing Limited, 1994. G. Lu and T. Yu, Energy ***Absorption of Structures and Materials***, Woodhead Publishing Limited, 2003. D. W. A. Rees, ***The Mechanics of Solids and Structures***, McGraw-Hill Book Company, 1990.
Planned learning activities and teaching methods:	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 web for students to use in combination with the textbooks. Furthermore theoretical principles are explained by means of specific examples and solution of specific problems. Lectures are supplemented with computer laboratory work carried out with the supervision of a lab assistant. Here a demonstration of actual problems and computational methods takes place. Additionally, during laboratory sessions, students apply their gained knowledge and identify the principles taught in the lecture sessions by means of working on different modelling tasks and evaluating simulation results.
Assessment methods and criteria:	• Assignments: 10% • Tests: 20% • Laboratory Work: 10% • Final Exam: 60%
Language of instruction:	English
Work placement(s):	No