Course unit title:	Mechanics of Automotive Engineering Materials with Lab		
Course unit code:	AU 201		
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 :	6		
Name of lecturer(s):	Dr.-Ing. Loucas Papadakis		
Learning outcomes of the course unit:	1. Explain the general concept on strength of automotive materials (tension, compression) and structure analysis for static problems. 2. Analyse and determine stresses and strains in automotive components. 3. Describe force variables in beams: force variables (Q, M), relationship between loads and internal force variables, integration and constraints, calculation methods of internal force variables. 4. Explain and apply the method for analysing pure bending and nonuniform bending including curvature of a beam, strains in beams (longitudinal, normal, shear) and beams with axial loads. 5. Determine the differential equations of the deflection curve and the slope by the double-Integration method. 6. Outline the definition of torsion loads and examine the deformations of circular bars of linearly elastic materials. 7. Describe the buckling effect and stability for columns with pinned ends and further support conditions. 8. Perform mechanical tests: Tension (I & II), compression, shearing, torsion test, strain measurements (strain gauges), deflection of beams test I (effect of beam length and width), deflection of beams Test II (Macaulay's method)		
Mode of delivery:	Face-to-face		
Prerequisites:	AU 112, ME 106	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	• **Theory and fundamentals in Strength of Materials:** normal stress and strain, linear elasticity, stress-strain curve, Hooke's law, Young's modulus, ductile and brittle materials, Poisson's ratio, shear stress and strain, shear modulus • **Stress and strain:** Analysis of stress and strain in materials and structures, principal stresses and maximum shear stresses. • **Force variables in beams:** internal force variables in beams, external loads with internal force variables • **Slope and deflection functions of beams** with the aid of the double-integration method • **Flexural (bending) stiffness** of profiles and torsion deformation of circular bar • **Plasticity**, general continuum approach especially during forming of sheet metal body components. • **Microscopic hardening mechanisms** of metal alloys and creation of high strength steel alloys • **Failure criteria** of metals and composites.		

	• **Buckling effect and stability of columns** with pinned ends and further support conditions • **Application on different examples:** the taught aspects in strength of materials are applied and analysed on specific structural static problems • **Laboratory work**, where students can apply their gained knowledge and discuss and evaluate practical test setups and measurements for better comprehension
Recommended and/or required reading:	
Textbooks:	R. C. Hibbeler, ***Mechanics of Materials***, Prentice Hall, 6th edition, 2005 J. Brown, A Robertson, J. Serpento, T. Stan, ***Motor Vehicle Structures: Concepts and Fundamentals***, Oxford: Butterworth, 2002
References:	J. M. Gere, ***Mechanics of Materials by Nelson***, Thornes Ltd, 5th edition, 2002 Ferdinand Pierre Beer, E. Russell Johnston, John T. Dewolf, McGraw Hill, ***Mechanics of Materials with tutorial CD***, 3rd edition, 2002 R. P. Kokernak, H. Morrow, ***Statics and Strength of Materials***, Prentice Hall College Div, 5th edition, 2004 J. M. Gere and S.P. Timosenko, ***Mechanics of Materials***, Thornes Ltd, 4th edition, 1999 Cheng, ***Statics and Strength of Materials***, 1997 J. Case, L. Chilver and C. Ross, ***Strength of Materials & Structures***,1996 D. Hull, T. W. Clyne, ***An Introduction to Composites Materials***, Cambridge University Press (C.U.P.), 1996 G. Davies, ***Materials for Automotive Bodies***, Elsevier, 2012
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 laboratory work carried out with the supervision of a lab assistant. Here a demonstration of actual problems and experimental 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 experimental setup, measuring and evaluation methods.
Assessment methods and criteria:	• Assignments: 10% • Tests: 10% • Laboratory Work: 20% • Final Exam: 60%
Language of instruction:	English
Work placement(s):	No