Course unit title:	Strength of Materials		
Course unit code:	CE200		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	2		
Semester when the unit is delivered:	3		
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Dr. Antonis Michael		
Learning outcomes of the course unit:	1. Explain the concept of free body diagrams, describe notion of stress and strain. 2. Calculate centroids and evaluate moment of inertias for different shapes and sections. 3. Analyse design considerations, explain thermal effects and introduce strain energy. 4. Describe concepts of normal and shear stresses and strains, stress-strain curves, Hooke's law, Young's modulus and shear modulus. 5. Explain the difference of ductile and brittle materials, and introduce Poisson's ratio. 6. Analyse the problem of stresses and strains in structures, describe plane stresses, principal stresses and maximum shear stresses. 7. Explain Mohr's Circle and Hooke's Law for plane stress and introduce triaxial stress and plane strain. 8. Understand the method for analysing pure bending and non-uniform bending, explain curvature of beams and strains in beams. 9. Explain the definition of torsional loads, determine the deformations of a circular bar, explain relationship between Moduli of Elasticity E and G, and describe buckling and stability for columns.		
Mode of delivery:	Face-to-face		
Prerequisites:	CE110	Co-requisites:	None
Recommended optional program components:			
Course contents:	**Introduction to Strength of Materials** Explain the importance and review the material related to the development of correct free body diagrams. Then define the terms stress and strain and differentiate between normal stress, shear stress and bending stress. Explain the mechanical properties and their role to the strength of materials. Explain the importance of section properties such as moment of inertia in stress development. Introduce the philosophy behind design and each design approach and also the role and the importance of the safety factor. Finally explain thermal effects and strain energy. **Tension, Compression and Shear** Understand general concept on Strength of Materials (Tension, Compression). Explain in detail the concept of normal stress and strain. Define the term Linear Elasticity and discuss in detail the Stress-Strain curve. Present the Hooke's law, Young's modulus and distinguish the Ductile and brittle materials. Define the Poisson's ratio and explain its significance. Also present Shear Stress and Strain, Shear Stress and Strain Curve and the Shear modulus. **Stress and Strain Analysis** Analyse of Stresses and Strains in structures. Those include the Plane Stress, Principal Stresses and Maximum Shear Stresses. Present the Mohr's Circle for Plane Stress and the Hooke's Law for Plane Stress. Finally present the concepts of Triaxial Stress and Plane Strain.		

	Centroids (Center of Mass): Calculate the centroids of different shapes and sections using first principles or alternatively when possible calculate the centroids of sections by dividing them into simpler subsections with known geometrical properties. **Moment of Inertia:** Present the concept of moment of inertia and its importance in engineering. Define "strong" and "weak" axis. Calculate the moment of inertia from first principles. Introduce the parallel axis theorem. Calculate the moment of inertia for different sections and about different axes. **Stresses in beams** Get familiar with the method for analysing pure Bending and Nonuniform Bending. Present the Curvature of a Beam the Strains in Beams (Longitudinal, Normal, Shear) and also the Beams with Axial Loads. **Torsion** Know the definition of Torsional loads and determine the deformations of a Circular Bar. Present the Circular Bars of Linearly Elastic Materials, the Stresses and Strain in Pure Shear and also the Relationship between Moduli of Elasticity E and G. **Buckling of Columns** Understand the definition of Buckling and Stability for Columns with Pinned Ends and for Columns with different Support Conditions.
Recommended and/or required reading:	
Textbooks:	"Mechanics of Materials", Russell C. Hibbeler, Prentice Hall, 6th edition, 2005
References:	"Mechanics of Materials", James M. Gere, Nelson Thornes Ltd, 5th edition, 2002 "Mechanics of Materials with tutorial CD", Ferdinand Pierre Beer, E. Russell Johnston, John T. Dewolf, McGraw Hill Text, 3rd edition, 2002 "Statics and Strength of Materials", Robert P. Kokernak, Harold Morrow, Prentice Hall College Div, 5th edition, 2004 "Mechanics of Materials", James M. Gere and S.P. Timosenko, Stanley Thornes Ltd, 4th edition, 1999
Planned learning activities and teaching methods:	The course is delivered through theoretical lectures in class. The lectures present to the student the course content and allow for questions. Part of the material is presented using visual aids. The aim is to familiarize the student with the different and faster pace of presentation and also allow the instructor to present related material (photographs, videos, etc.). The learning process is enhanced with the requirement from the student to solve relevant examples. Besides from the notes taken by students in class, all of the course material is available through the class website and also through e-learning platform. The students will also perform a series of experiments to measure experimentally stresses and/or strains under various loading conditions such as tensile and compressive loads and flexural loads, or to determine the modulus of elasticity for various materials. Finally the instructor is available to students during office hours or by appointment in order to provide any necessary tutoring.
Assessment methods and criteria:	• Coursework 50% • Final Exam 50%
Language of instruction:	English
Work placement(s):	No