Course unit title:	Mechanics of Structures		
Course unit code:	CE110		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	1		
Semester when the unit is delivered:	2		
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Dr. Antonis Michael		
Learning outcomes of the course unit:	1. Present the basic concepts and methods for the analysis and composition of forces, of particle equilibrium, summation of forces and moments, loading configurations, the importance of the Free Body Diagram, how to handle distributed loads, beam equilibrium, joint equilibrium. 2. Construct free body diagrams and develop equations of equilibrium for simple models. 3. Apply the principles of mechanics to the equilibrium of particles and beams, trusses, mechanisms. 4. Analyse trusses and mechanisms using the method of joints and the method of sections. 5. Create structural models to simulate the behaviour of simple structures. 6. Present the concepts of shear force, bending moment, slope and deflection, and their use in structural design. 7. Explain the importance of sign conventions in order to write equations to describe the distributions of shear-force and bending-moment across beam elements. 8. Construct bending moment and shear force diagrams.		
Mode of delivery:	Face-to-face		
Prerequisites:	None	Co-requisites:	None
Recommended optional program components:			
Course contents:	**Introduction:** Understand vectors and define the relation of vectors forces. Comprehend that the properties of the vectors can be used to model and manipulate forces. Define the different support types such as the free, the roller, the pin and the fixed support. Understand the physical meaning of each support and therefore reason the development of the reactions that are developed in each support. **Equilibrium:** Present the Newton's laws, explain their physical meaning and how they are applied in engineering. Define particles and solve problems of equilibrium regarding particles using the equations for the summation of forces. Define rigid bodies and explain the concept of moment. Then solve equilibrium problems with rigid bodies including the equation for the moments. **Beams:** Present "beams" in terms of their behaviour, their response to the application of the loads and the presence of the supports. Show the different types of externally applied loads (concentrated loads, distributed loads) and relate to real scenarios. Explain the concept of determinate structures. Create determinate beam configurations, apply the external loads and analyze to calculate the reactions at the supports. **Trusses:** Present "trusses" in terms of their element behaviour and interconnection, their response to the application of the loads and the presence of the supports. Discuss the different truss configurations (simple truss, compound truss, complex truss). Explain the importance of the connection between the elements and discuss tension and compression. Present the methods of truss analysis (method of joints and method of sections (Ritter)). Analyze trusses to calculate element forces and support reactions.		

	External and Internal Forces: Introduce the difference between the externally applied loads and the internal forces. Define the internal forces: Axial force, Shear force and bending moment and explain the mechanism that the internal loads are developed. Identify the different structural elements (truss, beam, frame, plate, shell etc) and their use in the different structural forms. Concentrate on the definition of beams and frames and define their properties and behaviour. **Shear and Bending Moment Equations:** Explain the concept of shear and bending moment. Explain how they are developed, their importance and use in structural analysis. Define the sign convention for the shear and bending moment and explain its significance. Write equations for shear and bending moment for different segments of beams. **Shear and Bending Moment Diagrams:** Define the designer's sign convention and explain the rules to draw the shear and bending moment diagrams. Define the slope of the shear and bending moment diagrams at a point based on the values of the load and the shear at the particular point. Draw shear diagrams based on the load curves and bending moment diagrams based on the areas of the shear curves.
Recommended and/or required reading:	
Textbooks:	"Engineering Mechanics – Statics SI", Russell C. Hibbeler, Pearson Education Center; 2009.
References:	"Vector Mechanics for Engineers – Statics in SI units", Ferdinand P. Beer / Johnson, Tata McGraw Hill, 2007. "Engineering Mechanics: Statics - SI version", Andrew Pytel, Jaan Kiusalaas, CL-Engineering, 2010.
Planned learning activities and teaching methods:	The course will be presented through theoretical lectures in class and experimental exercises in the laboratory. The lectures will present to the student the course content and allow for questions. Part of the material will be 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 etc) that would otherwise be very difficult to do. The learning process will be enhanced with the requirement from the student to solve exercises. These include self evaluation exercises which will be solved in class. These exercises will not be graded. Exercises will also be given as homework (final project) which will be part of their assessment. Besides from the notes taken by students in class, all of the course material will be made available through the class website and also through the eLearning platform. The students will also perform a series of experiments on various structures (simply supported beams, three-hinge arches, truss systems etc.) to measure experimentally reaction at supports and/or internal forces. Finally the instructor will be 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