Course unit title:	Steel Structures		
Course unit code:	CE410		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	4		
Semester when the unit is delivered:	7		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr Antonis Michael		
Learning outcomes of the course unit:	1. Outline the principles and concepts of modern design codes appropriate for different applications of steel and relate to the analysis and design stages. 2. Distinguish between working stress and Load Resistance Factor Design (LRFD) methods of analysis and design. 3. Apply & use code provisions in the determination of loads, application of appropriate load factors in the analysis of structures and design code provisions for serviceability and ultimate limit states. 4. Analyse and design beams, columns, and connections under various loading configurations. 5. Prepare detail construction drawings and specifications for construction. 6. Predict changes in the behaviour of the structure due to changes in usage and recommend course of action.		
Mode of delivery:	Face-to-face		
Prerequisites:	CE110	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	**Introduction:** The sources of structural loads are identified and the relevant loads for the type of structure are presented according to the relevant codes. The codes and specifications relating to steel structural analysis and design are presented and identified. Identify the material properties of steel. Identify various shapes associated with steel members and their typical applications. List the various types of steel member connections. Identify design principles such as factor of safety, working stress and Ultimate Limit State Design. Identify basic principles for the performance of structural analysis of steel structures. Apply code provisions for global analysis and imperfections. Determine cross section classification according to code. **Tension Members:** Identify tension member behaviour. List cases for using tension members. List tension member modes of failure. Analyze and design tension members according to code provisions. Identify and list tension member connection types. Analyze and design tension member connections for shearing in bolts, bearing of bolts, tension strength of connection plates, shearing of welds, tension strength of welds etc. **Compression Members:** Define compression member behaviour and modes of failure such as buckling. Analyze and design compression members according to code provisions for axial compressive loads. Analyze and design compression members according to code provisions for combined axial compressive loads and uniaxial or biaxial bending. **Flexural Members:** Define flexural member behaviour and modes of failure. Identify stress distribution in flexural members at different loading stages. Differentiate between elastic and plastic analysis and design of flexural members. Analyze bending stresses in flexural members. Define section modulus. Calculate stresses due to biaxial bending in flexural members. Identify and draw shear		

	stresses in elastic thin-walled open beam cross-sections. Define plastic analysis of beams. Identify the mechanisms of plastic hinge formation and identify possible collapse mechanisms due to plastic hinge formation in beams. Describe the procedure for the analysis and design of flexural members. Analyze and design flexural members according to code provisions for the ultimate limit state (axial, bending, and shear etc). **Beam Columns:** Define beam-column behaviour and modes of failure. Analyze beam-columns for bending and axial compression. Define biaxial bending in beam-columns. Verify capacity of beam-column under combined bending and axial compression according to code provisions. **Steel Connections:** List types of steel connections for steel structures. Identify bolt strength class, types of holes and spacing requirement according to code. Analyze and design bolted connections according to code requirements. Calculate number of bolts required for the connection. Analyze and design eccentrically loaded bolts in shear. Analyze and design eccentrically loaded bolts in combined shear and tension. Identify types of joints and welds for steel connections. Identify weld symbols and dimensional requirements for welds. Calculate fillet, plug and slot weld strength. Analyze and design eccentrically loaded welds in shear. Analyze and design eccentrically loaded welds in shear and tension. Analysis classification and modelling of steel connection.
Recommended and/or required reading:	
Textbooks:	Trahair N.S., Bradford M.A., Nethercot D.A. and Gardner L. (2008), "**The Behaviour and Design of Steel Structures to EC3**", 4th Edition, Taylor and Francis, 512 pp. Eurocode 3: **Design of steel structures – Part 1-1: General rules and rules for buildings** Eurocode 3: **Design of steel structures – Part 1-8: General – Design of joints**
References:	T. J. MacGinley and Hassan Al Nageim (2005), "**Steel Structures: Practical Design Studies", 3rd Edition**, Taylor and Francis, 352 pp. Jack McCormac (2008), "**Structural Steel Design**", 4th edition, Pearson Education, 704 pp. L. Gardner and David Nethercot (2005), "**Designers' Guide to En 1993-1-1 Eurocode 3: Design of Steel Structures: General Rules and Rules for Buildings**", Thomas Telford Ltd, 184 pp.
Planned learning activities and teaching methods:	The course is delivered to the students by means of lectures. The lecturer presents to the student the course content and allows for questions. The material is presented using computer presentations incorporating photos / diagrams. Presentation Handouts, homework assignments, and additional material such as relevant magazine articles are made available to students at any time on the e-learning Moodle platform. The learning process is enhanced with the requirement from the student to submit assessments.
Assessment methods and criteria:	• Coursework 30% • Final Exam 50%
Language of instruction:	English
Work placement(s):	No