UCLouvain

lgciv1022

2023

Mechanics of structures

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Latteur Pierre ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Advanced notions of Mathematics, Mechanics and Physics. In particular, course LFSAB1202 (Physics 2).
Main themes	See Chapter « Content » hereunder
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 At the end of the course, the student will be able to • Understand and apply the principles of the distribution of forces, constraints and deformations within the structures; • Design and calculate isostatic structures composed of compressed or tensioned bars, bent beams, cables, funicular arcs, elements subjected to combined forces; • Choose the types of structural elements and building materials by measuring the consequences of his choices on the behavior of structures. The course helps to develop the program's AA: A1.1, AA1.2, AA1.3
Evaluation methods	The exam is closed book and will consist of an approximately one-hour theoretical portion on structural mechanics and an approximately two-hour exercise portion with practical problems to solve. The theory part may include a demonstration. For the exercise part, the students can only have a handwritten personal summary on one A4 sheet, double-sided. Failure in either part will result in a final grade of less than 10/20 (both parts must be passed). The evaluation will cover all parts of the course. The chapters related to the calculation of internal forces and the drawing of internal force diagrams will have to be perfectly mastered. In addition, a good overall knowledge of the theoretical aspects of the course is necessary for success.
Teaching methods	Ex-cathedra and/or podcasts based on slides for volume 1. Supervised practical work in the classroom or remotely for volume 2.
Content	IMPORTANT NOTE: IN CASE OF FORCE MAJEURE (E.G. EPIDEMIC), THE CONTENT, ACTIVITIES, TEACHING METHODS AND EVALUATION METHODS MAY BE ADAPTED Chap. 1: the laws of the MDS confirmed by the natural structures Chap. 2: empiricism construction for millennia Chap. 3: brief history of the resistance of materials Chap. 4: building with the knowledge of the laws of nature Chap. 5: designing the structures Chap. 6: the categories of structures Chap. 7: the general approach of calculating a structure Chap. 8: mechanical properties of building materials Chap. 9: actions on structures, load cases, load combinations Chap. 10: strength and moment Chap. 11: equilibrium, 1st order, 2nd order, second order, ... Chap. 12: supports, hinges, isostaticity and hyperstaticity Chap. 13: basic geometrical characteristics of sections: area, inertia, static moment Chap. 14: notion of security, securty coefficients Chap. 15: design of the elements subjected to normal force, thermal actions Chap. 16: trusses Projection of a film on the construction of the Millau Bridge Chap. 17: Funicular arches Chap. 18: Cables Chap. 19: internal forces into the beams Chap. 20: stresses in the beams and design criteria Chap. 21: deformation of the beams

	Chap. 22: biaxial flexion, composed flexion, notions of prestress Chap. 23: stresses due to shear Chap. 24: stresses due to torsion (Chap. 25: continuous media and circle of Mohr) (Chap. 26: rupture criteria, intrinsic curves) Chap. 27: buckling Chap. 28: energy, virtual works theorem, unity force theorem Chap. 29: introduction to hyperstaticity
Inline resources	See MOODLE page of the course (slides and syllabus of solved exercises). Podcasts on : https://www.youtube.com/channel/UCvqPgjqATFrps2zA3PIRAMQ
Bibliography	Voir page MOODLE du cours.
Other infos	A didactic software for structural calculation (see www.issd.be) is used during the course and the practical work and is available to the students in the computer room. Its use is highly recommended.
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Bachelor in Engineering : Architecture	ARCH1BA	5		
Specialization track in Construction	FILGCE	5		
Minor in Construction	LMINOGCE	5		
Mineure Polytechnique	MINPOLY	5		