UCLouvain

lgciv1022

2019

Mechanics of structures

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 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). *The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	See Chapter « Content » hereunder
Aims	At the end of the course, the student will be able to 1 • 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 - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Exam of about an hour, about the theoretical concepts of the course (PART I) + exam of about 3 hours with practical problems to solve (PART II). The theoretical exam may include a demonstration. For the PART II exam, students can only have a personal handwritten summary on a single, double-sided A4 sheet. The success of both parties is required. If one of the two parties is in failure, the resulting score will be the minimum between the average score and 9/20. An eliminatory question on very basic aspects of the course is provided at the beginning of the exam. The final score will be 0/20 if this eliminatory question is not successful
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures with the help of slides for the volume 1. Tutorials with the teaching assistants for the volume 2
Content	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	Available on Moodle
Bibliography	• Transparents du cours ; • Vivement conseillé : « Introduction à l'analyse des structures », F. Frey et M-A. Studer, Presses polytechniques et universitaires romandes ; • Suggéré : « Analyse des structures et milieux continus), Volume 2 : Mécanique des structures, F. Frey, Presses polytechniques et universitaires romandes ; • Suggéré (parties concernant les arcs et les câbles) : « calculer une structure, de la théorie à l'exemple », P. Latteur, Editions L'Harmattan/Academia.
Other infos	A didactic software for calculating structures (see www.issd.be) is used during the course and TPs and is made available to students in computer room. Its use is highly recommended
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Engineering : Architecture	ARCH1BA	5	LEPL1101 AND LEPL1102 AND LEPL1105 AND LEPL1201 AND LEPL1202	
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Minor in Engineering Sciences: Construction (only available for reenrolment)	LGCE100I	5		
Minor in Construction	LFSA132I	5		
Specialization track in Construction	LGCE100P	5		