




5 credits

30.0 h + 30.0 h

Q2

Teacher(s)	Latteur Pierre ;Rondeaux Jean-François (compensates 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). <i>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.</i>
Main themes	See Chapter « Content » hereunder
Aims	<p>At the end of the course, the student will be able to</p> <ul style="list-style-type: none"> • 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. <p>The course helps to develop the program's AA: A1.1, AA1.2, AA1.3</p> <p>----- <i>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".</i></p>
Evaluation methods	<p>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.</p> <p>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.</p> <p>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</p>
Teaching methods	Ex-cathedra teaching with the help of slides for the volume 1. Practical works with the assistants for the volume 2
Content	<p>Chap. 1: the laws of the MDS confirmed by the natural structures</p> <p>Chap. 2: empiricism construction for millennia</p> <p>Chap. 3: brief history of the resistance of materials</p> <p>Chap. 4: building with the knowledge of the laws of nature</p> <p>Chap. 5: designing the structures</p> <p>Chap. 6: the categories of structures</p> <p>Chap. 7: the general approach of calculating a structure</p> <p>Chap. 8: mechanical properties of building materials</p> <p>Chap. 9: actions on structures, load cases, load combinations</p> <p>Chap. 10: strength and moment</p> <p>Chap. 11: equilibrium, 1st order, 2nd order, second order, ...</p> <p>Chap. 12: supports, hinges, isostaticity and hyperstaticity</p> <p>Chap. 13: basic geometrical characteristics of sections: area, inertia, static moment</p> <p>Chap. 14: notion of security, security coefficients</p> <p>Chap. 15: design of the elements subjected to normal force, thermal actions</p> <p>Chap. 16: trusses</p> <p>Projection of a film on the construction of the Millau Bridge</p> <p>Chap. 17: Funicular arches</p> <p>Chap. 18: Cables</p> <p>Chap. 19: internal forces into the beams</p> <p>Chap. 20: stresses in the beams and design criteria</p> <p>Chap. 21: deformation of the beams</p>

	<p>Chap. 22: biaxial flexion, composed flexion, notions of prestress</p> <p>Chap. 23: stresses due to shear</p> <p>Chap. 24: stresses due to torsion</p> <p>Chap. 25: continuous media and circle of Mohr</p> <p>Chap. 26: rupture criteria, intrinsic curves</p> <p>Chap. 27: buckling</p> <p>Chap. 28: energy, virtual works theorem, unity force theorem</p> <p>Chap. 29: introduction to hyperstaticity</p>
Inline resources	Available on Moodle
Bibliography	<ul style="list-style-type: none"> • 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
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Bachelor in Engineering	FSA1BA	5	LEPL1104 AND LEPL1202	
Bachelor in Engineering : Architecture	ARCH1BA	5	LEPL1101 AND LEPL1102 AND LEPL1105 AND LEPL1201 AND LEPL1202	
Minor in Engineering Sciences: Construction	LGCE100I	5		