UCLouvain

lgciv1023
2018

Construction stability

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Saraiva Esteves Pacheco De Almeida João ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Structural Mechanics (course LGCIV1031) and Strength of Material (course LGCIV1022) *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 "Content"
Aims	AA1.1, AA1.2, AA1.3, AA2.1, AA2.2 1 • Draw quickly, intuitively, and without calculations the distribution of internal forces in frame structures with corresponding main values, as well as the deformed configuration of statically-determined structures. • Determine the degree of static indeterminacy of a structure. • Solve statically determinate structures with the flexibility method, considering additionally the particular cases of variations of temperature, elastic supports, and imposed displacements. • Understand the concepts and application of the finite element method. Program a structural analysis code for 2D truss and frame structures, and compare with results from educational and commercial structural analysis software. • Understand the principles of structural dynamic behaviour. • Determine influence lines for statically determinate and indeterminate structures. • Analyse slabs with various boundary conditions - - - - *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	Written exam, group work. Specific details indicated in the Moodle course page.
Teaching methods	Lectures based on course slides and exercise solving with student participation. Tutorial-based individual learning of a programming language and structural analysis software.
Content	• Review of Structural Mechanics. • Statically determinate and indeterminate structures: external / global / internal indeterminacy, calculation of degree of statical indeterminacy. • Statically determinate structures: Computation of displacements with the unit dummy force method (virtual work), Mohr's integration tables. • Statically indeterminate structures: Introduction to different solution methods, conditions of compatibility and equilibrium. • Force (or flexibility) method: Primary system, general procedure, computation of internal forces. • Analysis of different statically determinate structures: Beams, frames, trusses, curved elements, statically-indeterminate arches. • Elastic supports, imposed displacements, thermal effects. • Finite element method: Nodal approximation, shape functions and solution procedure for truss and 2-noded plane beam finite elements, application to analysis of frames and trusses. • Influence lines (statically determinate and indeterminate structures). • Plates and slabs with different boundary conditions. • Introduction to dynamics of structures.
Inline resources	Available on Moodle
Bibliography	• Transparents du cours (Disponibles sur Moodle). • « Calculer une structure, de la théorie à l'exemple », P. Latteur, Editions L'Harmattan/Academia ; • « Analyse des structures et milieux continus), Volume 4 : Structures en barres et poutres, Pierino Lestuzzi et Léopold Pflug, Presses polytechniques et universitaires romandes • Un logiciel didactique de calcul des structures (www.issd.be) est utilisé pendant le cours et les TP et est mis à disposition des étudiants en salle informatique. • Un logiciel commercial est également disponible en salle informatique. Les étudiants peuvent librement télécharger ce logiciel ainsi que le tutorial associé (voir www.scia.be).

Faculty or entity in charge	GC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Civil Engineering	GCE2M	5		🔍
Bachelor in Engineering	FSA1BA	5	LGCIV1031 AND LGCIV1022	🔍
Bachelor in Engineering : Architecture	ARCH1BA	5	LGCIV1031 AND LGCIV1022	🔍
Minor in Engineering Sciences: Construction	LGCE100I	5		🔍