lgciv2044
2018

Structures under seismic & fire conditions

3 credits	20.0 h	Q2

Teacher(s)	Doneux Catherine ;Vassart Olivier ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	The course concerns two important types of exceptional accidental actions that can affect the structures: earthquakes and fires. The themes are: • The characteristics of the action (fire, earthquake); • The structural responses in dynamic and thermal terms; • The principles of anti-seismic design and fire protection; • The notions of response spectra and capacity design in seismic design; • The main lines of the Eurocodes prescriptions in terms of seismic calculation and taking into account fire
Aims	With reference to the AA reference system of the "Master of Civil Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: AA1.1, AA1.2, AA1.3, AA2.1, AA2.2, AA2.3, AA2.4, AA2.5, AA3.1, AA3.2, AA3.3, AA5.5, AA5.6 More specifically, at the end of this course, the student will be able to: Earthquake problematic: • Know the actions generated by an earthquake and the behavior of the structures that are subjected to it; • Master and apply the notion of response spectrum; • Understand and apply the basics of earthquake design; • Master the principles of seismic design and predesign in the case of a simple structure. Fire problematic: • Describe the thermal actions associated with the development of a fire; • Know the different possible approaches for calculating and characterizing a fire; • Describe the different parameters influencing the thermal behavior of materials (steel, concrete, wood) and the link with the modification of their mechanical behavior; • Describe the membrane behavior of composite steel-concrete structures in a fire situation; • Describe the steps involved in performing a fire engineering calculation on a typical building; • Know the advantages and disadvantages of the different types of fireproof design (coating, intumescent paints, Promat type materials, oversizing, etc.). - - - - *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	The students will be evaluated on the basis of two works, one in the field of seismic design, the other in fire resistance. The evaluation is based on • two written reports • an oral presentation with questions/answers
Teaching methods	Traditional teaching based on slides and exercises in small groups.
Content	Earthquake problematic: • Earthquakes: generalities; • Response of a structure subjected to an earthquake (elastic response, inelastic, notion of response spectrum, notion of capacity design, torsion); • Principles of seismic design of buildings; • Models for analysis; • General rules of analysis according to Eurocode 8; • Predimensioning methods; • Simple application to a steel structure. Fire problematic: • Thermal actions and development of a fire; • Thermal behavior of materials (steel, concrete and wood); • Mechanical behavior of high temperature materials (steel, concrete and wood);

	• Simple examples of application; • Special application and fire engineering; • Advantages and disadvantages of different means of anti fire design: coating, oversizing, intumescent paint, Promat type protection materials, etc; • Summary of Eurocode requirements for concrete, steel and wood
Inline resources	MoodleUCL website including the slides of the courses and several useful documents
Bibliography	Transparents du cours.
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Civil Engineering	GCE2M	3		🔍
Master [120] in Architecture and Engineering	ARCH2M	3		🔍