

4.00 credits

20.0 h + 15.0 h

Q2

Teacher(s)	Saraiva Esteves Pacheco De Almeida João ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Strength of Materials (course LGCIV1022), Structural Mechanics (course LGCIV1031) and Structural Analysis (course LGCIV1023) Strongly Advised: Dynamics of Structures (course LGCIV2042)
Main themes	The objective of the course is to present, discuss, and apply the fundamental set of tools to understand, analyse, and design civil engineering structures subjected to earthquakes.
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>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., AA5.5 and AA5.6 More specifically, at the end of this course, the student will be able to:</p> <p>Earthquake problematic:</p> <p>1 ' 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.</p>
Evaluation methods	Assignments and written exam. Specific details indicated in the Moodle course page. NOTE: These instructions take into account a "green" or "yellow" Covid scenario at UCLouvain. Modifications can be made in case of "orange" or "red" scenario, or restrictions in classroom capacities.
Teaching methods	Lectures based on course slides and exercise solving with student participation.
Content	<ul style="list-style-type: none"> <li>• Basics of seismology: plate tectonics theory, faulting, seismic waves, recording an earthquake, measuring an earthquake, source-to-site effects.</li> <li>• Overview of seismic risk: seismic hazard, exposure, response of structures and vulnerability.</li> <li>• Conceptual design of buildings: joints and discontinuities in plan, soft storeys and discontinuities in height, symmetry and torsional effects, bracing systems, short columns and partially infilled frames, non-structural elements, etc.</li> <li>• Seismic analysis and design – Part I: dynamic response of elastic SDoF and MDoF systems (revision), the fundamental period, elastic response of SDoF and elastic spectra, inelastic response of SDoF and inelastic spectra, force reduction factors, design spectra (Eurocode 8), vertical component of the ground motion.</li> <li>• Seismic analysis and design – Part II: response spectrum method, equivalent lateral force method, nonlinear static analysis, nonlinear time history analysis, conventional design versus capacity design, design according to Eurocode 8, myths and fallacies in Earthquake Engineering.</li> <li>• Reinforced concrete structures: capacity design of wall (buildings), plastic hinge analysis, drawbacks of force-based design (and intro to displacement-based design).</li> <li>• Overview on seismic behaviour of structures with other structural materials, base isolation, technological advances, current research, curiosities.</li> </ul>
Inline resources	Available on Moodle
Bibliography	- « Dynamics of structures: Theory and Applications to Earthquake Engineering », Anil K. Chopra, Prentice Hall, 2012. - « Génie parasismique: Conception et dimensionnement des bâtiments », Pierino Lestuzzi, Marc Badoux, Presses polytechniques et universitaires romandes, 2011.
Faculty or entity in charge	GC

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Civil Engineering	GCE2M	4		