

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)	François Bertrand ;Gérard Pierre ;Saraiva Esteves Pacheco De Almeida João ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	<p>The objective of the course is to study fundamental scientific and technical aspects linked to the understanding and analysis of structural materials and geomaterials in construction.</p> <p>The course aims at providing future engineers with an essential background on mechanics, geomechanics and properties of construction materials that will be useful throughout their study curriculum and professionally when managing civil engineering projects.</p>
Aims	<p>Specific learning outcomes of the course At the end of the course, students will be capable of:</p> <ul style="list-style-type: none"> • Describing the main physical and mechanical properties of solid materials used in structural engineering (steel, concrete, masonry, wood, new smart materials, etc). • Characterizing material stress and strain states, time-dependent behaviour (creep, relaxation, recovery), thermal effects, influence of imperfections and prestress, and accounting for the presence of shear in 2D and 3D. • Understanding the process of failure of ductile and brittle materials and applying suitable yield and failure criteria. • Establishing the link between theoretical formulations of mechanical properties and their empirical evaluation through laboratory testing. • Identifying the main types of rocks and minerals, and describing their formation processes and the impact on the mechanical, hydraulic and physical properties. • Describing a geological structure based on the reading of a geological map, and the impact of this structure on some civil engineering projects. • Describing and analysing the interaction of water and geomaterials. • Describing and applying the concept of stress in geomaterials. <p>-----</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>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Final written exam.</p>
Teaching methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>The teaching is organized in lecture sessions and exercise sessions. The lectures will be given in classroom by means of slides and demonstrations. The exercise sessions will take place in classroom but also laboratory sessions are programmed (LEMSC).</p>
Content	<p>The course is organised in 3 parts:</p> <ol style="list-style-type: none"> 1. Characterization of structural materials: <ul style="list-style-type: none"> • Steel: composition, production, use, properties. • Concrete: composition, use, properties. • Masonry and Wood. • New smart materials. 2. Characterization of material stress and strain states, and failure: <ul style="list-style-type: none"> • Mechanical properties of materials, static indeterminacy, thermal effects, imperfections, prestress, time-dependent behaviour (creep, relaxation, recovery), stress concentrations, etc. • Shear stress and strain, plane stress, principal stress and maximum shear stress, Mohr's circle for plane stress, triaxial stress, plane strain. • Failure criteria for ductile and brittle materials: Tresca, Von Mises, Rankine, Mohr-Coulomb, etc. Influence of repeated loading and fatigue. • Reinforced and prestressed concrete: quick overview on a 4-point beam bending test in the laboratory (LEMSC).

	<p>3. Notions of geomaterials:</p> <ul style="list-style-type: none"> • Genesis and genetic classification of rocks: igneous rocks, sedimentary rocks, and metamorphic rocks. Main physical properties of rocks. Rock identification. Soil formation. • Interpretation of geological maps. • Physical characterization of soils: Particle size distribution of fine and coarse soils, consistency, soil classification. Volume mass relationships, soil compaction. • Soil-water interaction, capillarity, Darcy law, 1D groundwater flow, laboratory hydraulic conductivity test, introduction to 2D groundwater flow (flownets). • Stress in soil, total stress, pore water pressure and effective stress.
Inline resources	Available on Moodle
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Engineering : Architecture	ARCH1BA	5		
Minor in Engineering Sciences: Construction (only available for reenrolment)	LGCE100I	5		
Minor in Construction	LFSA132I	5		
Specialization track in Construction	LGCE100P	5		