UCLouvain

lgciv1031

2018

STRUCTURAL MATERIALS AND GEOMATERIALS

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Bolly Pierre-Yves ;Cap Jean-François ;Pardoen Benoît coordinator ;Zastavni Denis ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	The objective of the course is to impart knowledge on managing different scientific and technical aspects linked to an optimal utilization of structural materials and geomaterials in construction, including natural resources and synthetic materials. The course aims at providing future engineers with an essential background on mechanics, geomechanics and properties of construction materials that will be useful to them in their professional life when studying and managing civil engineering projects.
Aims	**Contribution of the course to the program objectives (N°)** AA1.1, AA1.2, AA3.1, AA3.3, AA4.1, AA4.2, AA4.3, AA4,4, AA5.3, AA5.5, AA6.1 **Specific learning outcomes of the course** At the end of the course, students will be capable of: 1 • Describing the main physical and mechanical properties of solid materials used in structures (cement, concrete, steel, wood, masonry) • Describing the physical properties of geomaterials (rock, soil and derivatives). Identifying and classifying rocks, minerals and soils. • Describing and explaining the process of failure of materials (rupture, fatigue) and their time-dependent behaviour (yielding, relaxation). • Establishing the link between theoretical formulations of mechanical properties and their empirical evaluation through laboratory testing. • Describing and analysing the interaction of water and geomaterials. • Describing and applying the concept of stress in geomaterials - - - - *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	Practical work reporting, oral presentation and written exam. The evaluation conditions are specified during the courses.
Teaching methods	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).
Content	The course is organized in 3 parts: 1. Notions of concrete and steel: • Microscopic structure of solids: atomic structure - atomic bonds - crystalline/non-crystalline solids - defects ' classes of materials. • Physical and mechanical properties of structural materials: steel, cement, concrete, reinforced concrete, wood and masonry. Stress-strain relationship - elastic behavior - plastic and elastoplastic behavior ' time-dependent behavior (creep and relaxation). • Rheological models - failure and breakage - Variability of properties - temperature effects - ductile / brittle failure - damage and fatigue. • Laboratory sessions: properties of fresh concrete, hardened concrete properties, mechanical properties of steel, behavior of a reinforced concrete beam subjected to simple bending. 2. Notions of wood: • Use of wood in construction. Types of wood and physical/mechanical properties. • Wood strength, stiffness, structural features and durability 3. Notions of geomaterials: • Genesis and genetic classification of rocks: igneous rocks, sedimentary rocks, and metamorphic rocks. Main physical properties of rocks. Rock identification. Soil formation. • Geomorphology and geological map interpretation

	• 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
Bibliography	Diapositives et syllabus sur Moodle.
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Engineering	FSA1BA	5		
Bachelor in Engineering : Architecture	ARCH1BA	5		
Minor in Engineering Sciences: Construction	LGCE100I	5		