

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	60.0 h	Q1
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Teacher(s)	Altomonte Sergio ;Trachte Sophie ;Van Damme Manuel ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	<i>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.</i>
Aims	<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>
Evaluation methods	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <p><b>The "daylighting" and "Thermic and hygrothermic" parts</b> are assessed with a written exam. The goal is to assess the basic concepts knowledge. Regarding thermic and hygrothermic, the students will have to be able to apply theory to simple case studies.</p> <p>The <b>"acoustics" part</b> is assessed using a written test in two parts. 25% theoretical part (a question among previously known type questions) -75% exercises part with formulary.</p> <p>The <b>"building and performances" part</b> is assessed using two works (one group work and one individual work) :</p> <ul style="list-style-type: none"> <li>• Group work: based on plans, sections and photographs of houses designed by Belgian architects (documents provided by the teacher), students (in groups) are expected to re-draw the plans and sections at a 1/50 scale on a computerised support, to realise a full section at 1/20 and two technical details (sections/plans) at a 1/10 scale.</li> <li>• Individual work: creation of a documentary file, including the technical sheets of the main materials, technical details proposed by manufacturers (window frames, tightness, internal and external coatings') and the environmental documentation of the main materials components of the walls seen during the course.</li> </ul>
Teaching methods	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <p>The daylighting and thermic and hygrothermic parts are lectures.</p> <p>For the acoustics part:</p> <p>Lecture illustrated by PowerPoint slideshow (theoretical aspects, exercises, material performances, prediction methods, execution details, practical examples of project dimensioning).</p> <p>The building and performances part:</p> <ul style="list-style-type: none"> <li>• 9 lecture courses, each one divided in three parts:             <ul style="list-style-type: none"> <li>- An interactive and in common reflexion on the 'how to build'</li> <li>- Theoretical teaching of the constructive technology</li> <li>- Technical documents research (to be done by the students at the end of each course to put together the documentary file)</li> </ul> </li> <li>• 6 workshops to apply theoretical principles to an individual housing architectural project: design of the walls composition and technical details.</li> </ul>
Content	<p><b>"Daylighting" part</b></p> <p>The 6 hours course dedicated to daylighting allow to tackle the necessary basic notions required for the LICAR 1605 workshop, that is, the main photometric quantities and the metrics used in daylight.</p> <p>Then, daylight strategies are approached, with notions of glare and the means to protect from it.</p> <p><b>"Thermic and hygrothermic" part</b></p> <p>The course starts with a reminder of the several heat transfer modes. Base on that, the way to evaluate the heat transmission through a wall in static mode can be detailed. Then the students get to learn how to draw the evolution curves of these temperatures within a wall.</p> <p>Based on the diagram of moist air, students are then taught how to trace the vapor pressure curve within a wall and how to accurately assess the internal condensation risks. Then, the protection methods against that condensation are approached.</p> <p>Finally, the surface condensation phenomenon and its consequences are studied.</p> <p><b>"Acoustics" part</b></p>

The content is based on the implications of construction practice of the goal criteria of acoustic comfort of the buildings. These criteria are the common thread through the course. Five major themes of the building acoustics are successively developed:

1. basic principles of acoustics and noise of the technical equipment,
2. reverberation and acoustic correction,
3. impact sound insulation,
4. airborne sound insulation,
5. façade sound insulation.

For each of these five themes, the following aspects will be developed: theoretical notions, normative criteria, principles of dimensioning (prediction of building performance from the performance of the constituting building elements), examples and application exercises, practical case studies (analysis of building specifications, aspects of costs and constructive risks, visualization of execution details on site).

**"Building and performances" part**

The 30 hours of the course are dedicated to a constructive reflexion through technical detail practice. The first 9 courses aim at understanding the constructive principles of the building (mainly the individual housing) and their implication in the conception of the architectural project, by reviewing:

- Infrastructures and buried constructions
- Inner surfaces and walls
- Floors and slabs
- Façades and outer surfaces
- Roofs
- Openings and windows
- Staircases.

This theoretical part is followed by a group workshop (individual housing) aiming at developing:

- The understanding of the stakes of one particular project (structure, insulation, tightness, façades aesthetics')
- The understanding and analysis of a building's technology:
  - How does one build a surface, a building?
  - Which are the important elements?
  - How do the different layers articulate?
  - How are connexions executed?
- The understanding of the influence of technology on architecture: how to use the technical detail as an architectural design tool
- The understanding of the development of an architectural project through the selection of materials, of the building processes and their performances (technical and environmental)
- The capacity to design and draw the several details (plans/sections) techniques of a particular project

**Bibliography**

**Partie Eclairage naturel et Thermie et hygrothermie**

Les étudiant.e-s disposent d'un syllabus et des copies des « powerpoints » présentés au cours.

Livre : S. Reiter, A. De Herde, Guide à l'utilisation de l'éclairage naturel, UCL' Presses Universitaires de Louvain, 2003.

**Partie Acoustique**

Diverses sources mentionnées dans les différents chapitres du cours.

**Partie Construction et performances**

Les étudiant.e-s disposent des copies PDF des PowerPoints présentés au cours. Ces copies sont mises à disposition sur MOODLE ainsi qu'une série d'autres documents techniques. Chaque PowerPoint reprend une bibliographie spécifique liée à la thématique du cours.

Livres disponibles à la bibliothèque :

LIEBARD A. et DE HERDE, A., Traité d'architecture et d'urbanisme climatiques, Le Moniteur, 2005

TRACHTE S., Matériau, Matière d'Architecture Soutenable, thèse de doctorat, UCL, juin 2012

GAUZIN-MÜLLER, Construire avec le bois, Le Moniteur, Paris, 1999

HEGGER, AUCH-SCHWELK, FUCHS, ROSENKRANZ, Construire, Atlas des matériaux, éditions DETAIL, Presses Polytechniques et Universitaires Romandes, Lausanne, 2009

HERZOG, KRIPPNER, LANG, Construire des façades, éditions DETAIL, Presses Polytechniques et Universitaires Romandes, Lausanne, 2007

Passivhaus-Bauteilkatalog, Details for Passive Houses: Ökologisch bewertete Konstruktionen, A Catalogue of Ecologically Rated Constructions, publication de l'Österreichisches Institut für Baubiologie und Bauökologie, éditions Springer-Verlag en 2008

Construire avec l'acier, Le Moniteur, Paris, 2002

Construire avec les bétons, Le Moniteur, Paris, 2000 OLIVA, L'isolation écologique, conception, matériaux et mise en 'uvre, Terre Vivante, Mens, 2001

PFUNDSTEIN, GELLERT, SPITZNER, RUDOLPHI, Insulating materials - Principles, materials, applications, éditions DETAIL, 2007

SCHITTICH, Enveloppes: Concepts, Peaux, Matériaux, Birkhäuser, En Detail, 2005.

SCHITTICH, STAIB, BALKOW, SCHULER, SOBEK, Construire en verre, éditions DETAIL, Presses Polytechniques et Universitaires Romandes, Lausanne, 2001

Neufert, Ernst. Les Éléments des Projets de Construction, Paris : Dunod, 7è éd.

Faculty or entity in charge	LOCI
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<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Engineering : Architecture	ARCH1BA	5	LICAR1801	