

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

50.0 h

Q1

Teacher(s)	Altomonte Sergio ;Trachte Sophie ;Van Moeseke Geoffrey ;
Language :	French
Place of the course	Louvain-la-Neuve
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>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>The course is evaluated based on group works. The groups of students (maximum 3) will each produce a technical report, both textual and graphic, presenting an integration project of ventilation, heating, electricity, electric lighting, water conveyance and draining techniques for a house. This report will be handed in during the term and orally defended by the group in front of the teachers.</p> <p>The report presents:</p> <ul style="list-style-type: none"> • The selection made of the systems and equipment • The justification of the choices from a comfort, energy performance, dimensioning and architectural integration point of view • The associated calculation/simulation elements • The graphical documents of architectural integration <p>The groups of students have at their disposal, from the beginning of the term, a documentation of case studies delivered by the corresponding teachers at an "urbanistic project" state of progress, on which base they will develop their proposal.</p> <p>Evaluation criteria :</p> <p>The evaluation of the report and its oral defense will focus on the following criteria:</p> <ol style="list-style-type: none"> 1. Demonstration by students of their understanding of basic physical concepts that allow control of the mood and comfort 2. Demonstration of their ability to design and calculate an air conditioning and lighting system 3. Demonstrate their ability to develop heating, cooling, ventilation, and lighting strategies that are consistent with well-being and environmental performance goals 4. Demonstration of their knowledge and understanding of the technologies associated with these strategies 5. Demonstration of their ability to integrate these technologies into the architectural composition of buildings <p>Criteria 3 and 5 are particularly important.</p> <p>A single rating is assigned to the entire group.</p> <p>Although the organization of this work is conducive to a distribution of topics among students of a group, we strongly encourage you not to compartmentalize your work. At a minimum, critical cross-readings of individual productions should be organized within each group. During the oral defense, each student must be able to justify all the choices and assessments presented.</p>
Teaching methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>The activities are organised as follows: An ongoing practical exercise of design/dimensioning/integration of the technical installations of a housing project is the thread of the tuition unit and the basis of evaluation.</p> <p>This exercise is sustained by:</p> <ul style="list-style-type: none"> • Support sessions (6), in the form of table sitting or workshops, animated by one of the teachers • Lecturing sessions (16) of theoretical concept presentations, of the targeted technical systems, aiming at a generalisation • The provision of reference documents (syllabus, professional documentation, calculation tools) • Documentation/objectification exercises of existing situations with benchmarking purpose • Calculation and modelling exercises
Content	<p>The general objective of this course is to learn to determine and calculate the setup of the main technical installations of a building, in particular ventilation, heating, air-conditioning, water conveyance and draining, people transfers, day- and electric lighting.</p> <p>The emphasis is set on the aspects of energetic efficiency and comfort, with a bioclimatic approach, and architectural integration. Given its multidisciplinary nature, the course is given by several teachers.</p>

The course is divided in four parts : bioclimatics and HVAC, artificial lighting, electricity, architectural integration.

Bioclimatics and HVAC part

Debates, activities and lectures introduce the working principles of the different current HVAC and hydraulic technologies and their integration in the buildings. They address as well the housing as the current tertiary functionalities.

The lectures focus on the systemic dimension of these technologies more than on their individual behaviours. The objective is to familiarize the student with the complexity of these techniques, which is more related to their interweaving than to the complexity of each introduced system.

This part of the course aims primarily at training for the pertinent selection of the HVAC systems according to the physical properties and use of the building, rather than for their optimisation.

More concretely, the addressed contents are:

- Climatic sizes and bioclimatic architecture
- Reminders of the thermic comfort theory, the heat transfers and the moist air physics
- Heat production and exchange technologies
- Air and hydraulic networks technologies
- HVAC systems dimensioning norms
- Energy performance norms and standards

Electricity part

The course starts with a reminder of the notions of electricity as viewed in the Physics 1 course, together with the basic laws for direct and alternative currents. Then comes the presentation of the miscellaneous electricity production techniques.

Then, the risks linked to the use of electricity in the building are studied in details, together with the protection systems. This part about electricity is then finalised with the study of the electrical control systems, with a particular emphasis on the lighting control.

More concretely, the addressed contents are:

- Definitions (static electricity, electric current, current direction)
- Production of electricity
- Direct and alternative electric current
- Electric security and protection systems
- Lighting control systems

Electric Lighting part

The chapter about lighting starts with an accurate study of visual comfort, related with the human eye physiognomy. Then come the technical characteristics of the lamps, luminaires and auxiliary elements, as well as the impact of their selection on the quality of a lighting installation. The miscellaneous light production techniques are studied in details. The current European regulations about lighting is then addressed. Then, based on the acquired knowledge and developed competences, the students have to establish a survey of the lighting in their home, criticize this installation and suggest changes to improve comfort and lower its environmental impact. Therefore, they are divided in two groups and have the possibility of using the measurement equipment of the research team "Architecture & Climat". In the frame of this exercise, they are prompted to explore techniques which may not have been approached during the course, but which are mentioned in numerous bibliographical sources given by the teacher.

More concretely, the addressed contents are:

- Visual comfort and vision
- The lamps
- Luminaires and auxiliary elements
- Regulations and norms
- Practical work of survey, critics and renovation of a domestic lighting installation


Architectural integration part

This part aims at the understanding of the technical equipment and systems of a building and their impact on the architectural project design. It is based on a practical work aiming at developing:

- the understanding of the issues of a specific project
- the ability to select systems and equipment suited to a specific project (from an architectural and technical point of view)
- the ability to design a system of technical equipment for a specific project: heating, ventilation, sanitary and electrical appliances
- the ability to pre-dimension these appliances

the ability to establish the different technical plans of a specific project

<p>Other infos</p>	<p>All the course's documents are available on Moodle. A syllabus exists for the parts "Bioclimatics and HVAC" and "Electricity and lighting".</p> <p>The one addressing "Bioclimatics and HVAC" is available as a PDF document on Moodle and in print at the SICI. It should be considered as a reference document, with a scope larger than the course. This part of the course also largely refers to the on-line encyclopaedia www.energieplus-lesite.be</p> <p>For the "Electricity and Lighting" part, the syllabus is available as a PDF document on Moodle and in print at the SICI. The copies of all PowerPoint pages are also available in the "documents" section.</p> <p>Bibliographical references:</p> <p>Guide d'aide à l'utilisation de l'éclairage artificiel en complément à l'éclairage naturel. M. Bodart et A. De Herde, Ministère de la Région Wallonne. This book is available at the Architecture library (BAIU – VINCI building).</p> <p>Be careful, the syllabus and transparencies are only for students of the course. For copyright issues, it is completely forbidden to make them available to anyone else or on the web.</p>
<p>Faculty or entity in charge</p>	<p>LOCI</p>

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Civil Engineering	GCE2M	5		
Master [120] in Architecture and Engineering	ARCH2M	5		