UCLouvain

licar1831

2026

Environmental Physics

5.00 credits	50.0 h	Q1

Teacher(s)	Altomonte Sergio ;Van Damme Manuel ;
Language :	French
Place of the course	Louvain-la-Neuve
Learning outcomes	
Evaluation methods	Written exam
Teaching methods	Ex-cathedra lectures and guided exercises
Content	This UE addresses four main chapters: ***1. Hygrothermal and physical transfers of humid air*** This chapter introduces the heat exchanges through conduction, convection and radiation, and applies these concepts to simple problems in architecture. Focus is given to the physics of walls, introducing the concepts of thermal resistance, inertia and vapour resistance, and leading to the calculation of surface and internal condensation risks. The chapter introduces the concepts of absolute and relative humidity, dew point, sensible and latent heat, and phase change, and uses the psychrometric diagram as a tool for quantifying energy flows related to hygrothermal fluctuations. The basic principles of flow are also discussed and applied to simple problems. ***2. Thermal comfort*** The main theories and models related to thermal comfort are discussed: thermal equilibrium, PMV/PPD, adaptive comfort, neutral temperature, comfort zones, psychrometric chart, alliesthesia, personal comfort systems. ***3. Natural and artificial light*** The lectures devoted to natural and artificial lighting present the main photometric quantities and metrics used. Based on the concepts of solar geometry, the course introduces the fundamental principles of natural lighting, including considerations of geographical, climatic and seasonal variation. We then discuss natural lighting strategies, the concepts of glare and solar gain, and ways to distribute light throughout spaces, as well as how to protect against it. The fundamental units for the static and dynamic calculation of light sufficiency are then presented, along with strategies for integrating natural light into architectural design. This chapter also presents the fundamental characteristics and types of artificial lighting systems, including their geometric and photometric properties, how they work, and the strategies needed to integrate them with daylight in architectural projects. ***4. Acoustics*** The content is based on the practical implications of the objective criteria for acoustic comfort in buildings. These criteria serve as a common thread throughout the course. The five main themes of building acoustics are developed in succession: 1. Basic principles of acoustics and noise from technical equipments; 2. Reverberation and acoustic correction; 3. Impact sound insulation; 4. Airborne sound insulation; 5. Acoustic insulation of facades. For each of these five themes, the following aspects will be developed: theoretical concepts, normative criteria, design principles (predicting the performance of the building based on the performance of the materials it is made of), examples and application exercises, practical case studies (analysis of specifications, construction costs and risks, and visualisation of construction details on site).
Inline resources	The course slides are uploaded each week to the Moodle page.
Bibliography	• Szokolay, S. (2014). *Introduction to Architectural Science: The Basis of Sustainable Design*. Architectural Press: Oxford, 3rd edition • Boyce, P. (2014). *Human factors in lighting*. CRC: New York. • Brown, G.Z., Dekay, M. (2000). *Sun, Wind and Light*. John Wiley and Sons Ltd: New York.
Faculty or entity in charge	LOCI

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Engineering : Architecture	ARCH1BA	5		