Syllabus

Course Description

Course Title	High-Performance Buildings: Comfort, Energy Efficiency
Course Code	42641
Course Title Additional	
Scientific-Disciplinary Sector	IIND-07/B
Language	English
Degree Course	Professional Bachelor in Wood Technology
Other Degree Courses (Loaned)	
Lecturers	Prof. Giovanni Pernigotto, Giovanni.Pernigotto@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/30622 dr. Federica Morandi, Federica.Morandi@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/41968
Teaching Assistant	
Semester	First semester
Course Year/s	3
CP	4
Teaching Hours	40
Lab Hours	0
Individual Study Hours	60
Planned Office Hours	
Contents Summary	• Framework of main laws and technical standards currently in force regarding building energy efficiency and the energy performance of building envelope components. • Calculation tools and implementation of reference cases. • Diagnosis of building energy performance and analysis of different solutions, for improvement and optimization – in particular, for the what concerns geometrical and material thermal

	bridges, windows, and window-wall nodes. • Multi-domain comfort analysis: assessment of thermal, visual, acoustic comfort and indoor air quality. • Indoor lighting: artificial lighting system design and control.
Course Topics	The course provides description and applicative examples of the calculation methods proposed by the current technical standards for the design of high-performance buildings. Particular focus is put on the building envelope and on its architectural details, with the aim of assessing the impact of different technological solutions on both building energy performance and the quality of the built environment. In this framework, the occupants' perception of the built environment is characterized in terms of multi-domain comfort, including aspects related to thermal comfort, indoor lighting, acoustic performance and indoor air quality, providing both theoretical background and design applications.
Keywords	Building energy performance; thermal comfort; indoor air quality; indoor lighting; acoustic performance
Recommended Prerequisites	Heat and mass transfer (preferably).
Propaedeutic Courses	
Teaching Format	The course is based on theoretical teaching activities and examples shown in the classroom regarding current methodologies and regulations, exercises and energy simulations.
Mandatory Attendance	Not mandatory.
Specific Educational Objectives and Learning Outcomes	The course is an "attività formativa caratterizzante" (IIND-07/B, Building Physics and Building Energy Systems). The course provides description and applicative examples of the calculation methods proposed by the current technical standards for the design of high-performance buildings. Particular focus is put on the building envelope and on its architectural details, with the aim of assessing the impact of different technological solutions on both building energy performance and the quality of the built environment. In this framework, the occupants' perception of the built environment is characterized in terms of multi-domain comfort, including aspects related to thermal comfort, indoor lighting, acoustic performance and indoor air quality, providing both theoretical background and design applications. Intended Learning Outcomes (ILO)

	Knowledge and understanding 1. Knowledge of the calculation methods described by the current technical standards for building energy performance assessment. Knowledge of the laws currently in force regarding building energy efficiency and requirements. Applying knowledge and understanding 2. Capability to implement the procedures described by the technical standards; capability to develop design and diagnostic skills related to energy efficiency, comfort, and indoor lighting; capability to improve the energy performance of a real case-study. Making judgements 3. The student will be able to assess the energy performance of both existing and new buildings, to identify the critical aspects and suggest improvement solutions. Communication skills 4. The student will be able to discuss the learned knowledge with vocabulary and technical terms of the discipline. Ability to learn 5. Lifelong learning capability through the acquisition of critical tools and critical evaluation of product specifications.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	The exam consists of an oral examination; candidates will present the individual work carried out on a case study. The exam will further proceed with questions aimed at verifying the knowledge and the capability to understand the topics of the course and the mastery of the technical language. The capability to transfer these competences to applicative cases and the developed autonomy of judgment will be evaluated through the discussion of the design work assigned during the course. Formative assessment: - Development of the assigned design work: during the course; ILOs assessed: (2), (3), (5).

	Summative assessment: - 100% oral examination, including discussion of the design work: about 45 minutes; ILOs assessed: All except (5).
Evaluation Criteria	A single final vote will consider the knowledge of the course content (max 15 points), the ability to apply the learnt topic (max 5 points), the ability to synthesize information, the correctness of the technical terms and clarity (max 5 points). With reference to the design work developed, the ability to analyze the proposed problem and to formulate a cost-effective and technically advantageous solution will be considered (max 5 points). During the development of the project, the ability to learn will be assessed through the ability to consult autonomously further references in the technical literature (max 2 points).
Required Readings	Lessons and slides of the course.
Supplementary Readings	Technical standards and, in particular: - UNI EN ISO 6946:2018 - UNI EN ISO 52016-1:2018 - UNI/TS 11300-1:2014 - UNI EN ISO 10211:2018 - UNI EN ISO 10077-1:2018 and -2:2018 - EN 16798-1:2019 - EN 12464-1:2021
Further Information	Software used: Main tools used during the course: • Berkeley Lab THERM (freeware, https://windows.lbl.gov/therm-software-downloads) • Berkeley Lab WINDOW (freeware, https://windows.lbl.gov/window-software-downloads) • DIALux evo (freeware, https://www.dialux.com/en-GB/dialux).
Sustainable Development Goals (SDGs)	Good health and well-being, Sustainable cities and communities, Affordable and clean energy