Syllabus

Course Description

Course Title	Application of Technical Standards for Building Energy Efficiency
Course Code	43092
Course Title Additional	
Scientific-Disciplinary Sector	ING-IND/11
Language	Italian
Degree Course	Bachelor in Industrial and Mechanical Engineering
Other Degree Courses (Loaned)	
Lecturers	Prof. Giovanni Pernigotto, Giovanni.Pernigotto@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/30622
Teaching Assistant	
Semester	Second semester
Course Year/s	Opt.
CP	3
Teaching Hours	18
Lab Hours	12
Individual Study Hours	45
Planned Office Hours	9
Contents Summary	List of topics Core topics of the course: • Building energy balance, • Quasi-steady state method for the assessment of the building energy performance, • Heat exchanges in buildings. Complementary topics of the course: • Trends in energy sources and consumption in Italy, Europe and in a global scale, • Thermal-hygrometric performance of the building envelope components, mass transfer through opaque components, • Building energy audit,

	• Indoor lighting design. This course provides a general framework of the laws currently in force regarding the building energy efficiency and of the current technical standards for the assessment of the energy performance of buildings and envelope components. Calculation tools and application to reference cases are shown and used, in order to perform an assessment of the energy performance of an existing building, analyzing different retrofit solutions for its improvement and optimization – in particular, for the what concerns geometrical and material thermal bridges, windows and window-wall nodes. Finally, an introduction to indoor lighting design is offered.
Course Topics	Core topics of the course: - Building energy balance, - Quasi-steady state method for the assessment of the building energy performance, - Heat exchanges in buildings. Complementary topics of the course: - Trends in energy sources and consumption in Italy, Europe and in a global scale, - Thermal-hygrometric performance of the building envelope components, mass transfer through opaque components, - Building energy audit, - Indoor lighting design.
Keywords	Energy certification of buildings; energy balance; heat exchange; energy diagnosis; energy performance of buildings
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	The course is divided into theoretical teaching activities in classroom regarding the current methodologies and regulations, exercises, i.e., computer numerical implementation of the described methods, and in-situ activities (in laboratory or construction site) for the verification of the practical aspects.
Mandatory Attendance	Not mandatory.
Specific Educational Objectives and Learning Outcomes	The course is dedicated to the analysis and the implementation by means of dedicated software and codes of the calculation methods proposed by the current technical standards for building energy performance assessment, focusing on the building envelope and on

	its architectural details. Construction details and calculation aspects are presented with the aim to allow for the assessment of the impact of different solutions on the quality of the built environment. In particular, it is expected that the student will obtain knowledge regarding the main characteristics of the building system, the optimization strategies and the improvement of the building energy efficiency, as well as the requirements prescribed by the laws currently in force. Knowledge and understanding • 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 • Capability to implement the procedures described by the technical standards, to develop design and energy audit skills and to improve the energy performance of a case-study building. Making judgements • 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 • The student will be able to discuss the learned knowledge with vocabulary and technical terms of the discipline. Ability to learn • Lifelong learning capability through the acquisition of critical tools and critical evaluation of product specifications.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	Oral examination 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 take into account of the knowledge of the course content (max 15 points), of the ability of applying the learnt topic (max 5 points), of the ability to synthesize information, correctness of the technical terms and clarity (max 5 points). With reference to the developed design work, the capability to analyze the proposed problem and to formulate a cost-effective and technically advantageous solution will be taken into account (max 5 points). During the development of the project, the ability to learn will be assessed through the ability of 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 13788:2013; - UNI EN ISO 52016-1:2018; - UNI/TS 11300-1:2014; - UNI EN ISO 10211:2018; - UNI EN ISO 10077-1:2018 e -2:2025; - UNI EN 12464-1:2021; - UNI EN 15193-1:2021. Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it and Ilaria Miceli, Ilaria.Miceli@unibz.it
Further Information	Main software used during the course:

	• ProCasaClima (freeware, available at: https://www.agenziacasaclima.it/it/software-casaclima-2239.html) • Berkeley Lab THERM (freeware, available at: https://windows.lbl.gov/therm-software-downloads) • Berkeley Lab WINDOW (freeware, available at: https://windows.lbl.gov/window-software-downloads) • DIALux evo (freeware, available at: https://www.dialux.com/en-GB/dialux).
Sustainable Development Goals (SDGs)	Good health and well-being, Climate action, Sustainable cities and communities, Affordable and clean energy