Course Title	Energy Retrofit of the Built Environment
Level and Degree Program	Master's Degree in Civil Engineering (LM-23)
Scientific Disciplinary Sector (SSD)	ING-IND/11
Year of Study	2nd Year
Academic Year	2024-2025
Total Credits	6 CFU
Prerequisites	Applied Physics or Applied Thermodynamics
Instructor	Edoardo De Cristo https://ricerca.unicusano.it/author/edoardo-decristo/ Program: Civil Engineering Nickname: edoardo.decristo Email: edoardo.decristo@unicusano.it Office Hours: Please refer to the schedule on our website for videoconference times (http://www.unicusano.it/calendario-lezioni-in-presenza/calendario-area-ingegneristica)
Course Description	The Energy Retrofit of the Built Environment course aims to provide fundamental knowledge for understanding the thermal behavior of buildings, conducting instrumental energy diagnosis, and implementing practical interventions to reduce energy demands. Additionally, the course addresses regulatory developments and explores contemporary computational tools for energy certification and retrofitting. These aspects are analyzed

	considering the economic viability of interventions and the integration of sustainability certification protocols.
Learning Objectives	The expected learning outcomes include: • Acquisition of knowledge on energy retrofitting methods for building envelopes and instrumental diagnostic techniques. • Development of skills to apply acquired competencies in the energy retrofitting of buildings. • Ability to interpret the energy performance of envelope elements to determine appropriate interventions for achieving desired outcomes. • Development of a precise and unambiguous technical-scientific language to effectively communicate acquired technical knowledge. • Application of learned concepts for optimizing building energy performance.
Prerequisites	Attendance requires prior completion of Applied Physics or Applied Thermodynamics. A foundational understanding of heat transfer is recommended.
Expected Learning Outcomes	**Knowledge and Understanding** Mastery of energy retrofitting techniques for building envelopes and diagnostic methods. **Application of Knowledge** Ability to apply acquired knowledge for the energy retrofit of buildings. **Critical Thinking and Problem-Solving** Capacity to analyze the energy behavior of envelope components and identify necessary interventions. **Communication Skills** Proficiency in technical-scientific language to articulate concepts clearly and concisely. **Learning Skills** Ability to apply acquired knowledge for optimizing building energy efficiency.
Course Structure	The course material is divided into six modules, covering the entire syllabus. Each module includes lecture notes, slides, and video lectures where the instructor provides commentary. The available materials are designed to facilitate the comprehension of all covered topics. Each module includes self-assessment tests, enabling students to evaluate their progress and identify knowledge gaps. The virtual classroom, supervised by the instructor, fosters collaborative project development, discussion forums, and peer-supported learning. The course includes a non-mandatory E-tivity, requiring students to apply acquired knowledge. The assignment must be submitted within 15 days of the exam date and undergoes a preliminary evaluation by the instructor. Students may be required to revise their submissions within seven days. The E-tivity focuses on the energy diagnosis and

	retrofit of an existing building using computational tools such as DOCET (provided by ENEA and CNR) or equivalent commercial software. The total study load for the course is approximately 150 hours (25 hours per CFU), distributed as follows: • 120 hours – Review and study of course materials • 30 hours – Interactive learning activities (E-tivity).
Course Content	1. Building Envelope Physics, HVAC Systems, Acoustics, and Lighting (30-hour study load) 2. Regulatory Framework and Computational Tools (20-hour study load) 3. Instrumental Energy Diagnosis of Buildings (15-hour study load) 4. Retrofitting Methods for Building Envelopes (20-hour study load) 5. Retrofitting Methods for HVAC Systems (20-hour study load) 6. Economic Aspects of Energy Efficiency Interventions & Sustainability Certification Protocols (15-hour study load)
Study Materials	Course materials are provided by the instructor.
Assessment Methods	The exam consists of a written test with five open-ended questions covering course topics. Each response is evaluated on a 0-5 point scale, considering: • Relevance to the question • Completeness of information • Logical development of the response Students may earn up to 8 additional points through the E-tivity, allowing for a final score of up to 33/30.
Final Thesis Assignment	The thesis topic is assigned following a discussion with the instructor, during which the student expresses their research interests. There are no eligibility restrictions or GPA requirements for thesis requests.