ANNEX 1.2

DEGREE PROGRAM DIDACTIC REGULATIONS

BUILDING ENGINEERING FOR SUSTAINABILITY

CLASS LM-24

School: Politecnica e delle Scienze di Base of University of Naples Federico II

Department: Civil, Building and Environmental Engineering (DICEA) - University of Naples Federico II

Didactic Regulations in force since the academic year 2025 - 2026

STUDY PLAN

KEY

Type of Educational Activity (TAF):
B = Characterising
C = Related or Supplementary
D = At the student's choice
E = Final examination and language knowledge
F = Further training activities

Year I – semester I									
Curriculum - common pathway									
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities** *(lectures, workshops, etc.)*	**Course Modalities** *(in-person, by distance)*	**TAF**	**Disciplinary area**	**Mandatory/ optional**
Geotechnical works for construction	CEAR-05/A (ex ICAR/07)	single	9	72	Frontal lesson	In-person	B	Building and the environment	Mandatory
New Strategies of Territorial Government	CEAR-12/A (ex ICAR/20)	single	9	72	Frontal lesson	In-person	B	Architecture and urban planning	Mandatory
Responses of structures to seismic and climatic hazards	CEAR-07/A (ex ICAR/09)	single	9	72	Frontal lesson	In-person	B	Architecture and urban planning	Mandatory

Year I – semester II									
Curriculum - common pathway									
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities** *(lectures, workshops, etc.)*	**Course Modalities** *(in-person, by distance)*	**TAF**	**Disciplinary area**	**Mandatory/ optional**

Building systems elements and planned maintenance – module 1: Management of System Design	CEAR-08/A (ex ICAR/10)	single	6	48	Frontal lesson	In-person	B	Architecture and urban planning	Mandatory
Building systems elements and planned maintenance – module 1: Scheduled Maintenance	CEAR-08/B (ex ICAR/11)	single	6	48	Frontal lesson	In-person	B	Architecture and urban planning	Mandatory
BIM and Coordination Management for Building Construction	CEAR-10/A (ex ICAR/17)	single	9	72	Frontal lesson	In-person	B	Architecture and urban planning	Mandatory
Energy efficiency of the building and climate control systems	IIND-07/B (ex ING-IND 11)	single	9	72	Frontal lesson	In-person		Building and the environment	Mandatory

Year II – semester I

Curriculum - common pathway

Title Course	SSD	Module	CREDITS	Hours	Type Activities *(lectures, workshops, etc.)*	Course Modalities *(in-person, by distance)*	TAF	Disciplinary area	Mandatory/ optional
Urban marketing and real estate valorization	CEAR-03/C (ex ICAR-22)	single	9	72	Frontal lesson	In-person	B	Building and the environment	Mandatory
Sustainable Urban Project	CEAR-09/A (ex ICAR/14)	single	9	72	Frontal lesson	In-person	B	Architecture and urban planning	Mandatory
Course chosen from the exams of the curriculum selected by the student (from A, B or C)		single	9	72	Frontal lesson	In-person	C	Related or Supplementary	One of your choices

Year II – semester II

Curriculum - common pathway

Title Course	SSD	Module	CREDITS	Hours	Type Activities *(lectures, workshops, etc.)*	Course Modalities *(in-person, by distance)*	TAF	Disciplinary area	Mandatory/ optional
Course chosen from the exams of the curriculum selected by the student (from A, B or C)		single	9	72	Frontal lesson	In-person	C	Related or Supplementary	One of your choices
Internship/other knowledge			6				F		
Internship as part of the final examination			3				E		
Final examination			9				E		

Year I/II – semester I/ II

Curriculum - common pathway

Title Course	SSD	Module	CREDITS	Hours	Type Activities *(lectures, workshops, etc.)*	Course Modalities *(in-person, by distance)*	TAF	Disciplinary area	Mandatory/ optional

Course of your choice among all the exams offered at the University		single	9	72	Frontal lesson	In-person	D		One of your choices

Curricula									
Curriculum A **Sustainable Structures in Risk Conditions**									
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities** *(lectures, workshops, etc.)*	**Course Modalities** *(in-person, by distance)*	**TAF**	**Disciplinary area**	**Semester**
Timber construction	CEA-07/A (ex ICAR-09)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Structures for high-rise and long-span buildings	CEA-07/A (ex ICAR-09)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Diagnosis and Therapy of Structural Failures	CEA-07/A (ex ICAR-09)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Reinforced Concrete Buildings.	CEA-07/A (ex ICAR-09)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second
Design of steel sustainable structures	CEA-07/A (ex ICAR-09)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second

Curricula									
Curriculum B **Sustainable Building Recovery and Urban Regeneration**									
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities** *(lectures, workshops, etc.)*	**Course Modalities** *(in-person, by distance)*	**TAF**	**Disciplinary area**	**Semester**
Urban regeneration and adaptation to climate change	CEAR-12/ (ex ICAR-20)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Territorial Information Systems	CEAR-12/ (ex ICAR-20)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Building recovery project	CEAR-08/A (ex ICAR/10	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second
Design and Consolidation of Masonry Structures	CEA-07/A (ex ICAR-09)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second
Regenerative Architectural Design	CEAR-09/A (ex ICAR/14)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second

Curricula									
Curriculum C **Energy saving and environmentally sustainable management of buildings**									
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities**	**Course Modalities** *(in-person,*	**TAF**	**Disciplinary area**	**Semester**

					(lectures, workshops, etc.)	*by distance)*			
Building technology design	CEAR-08/A (ex ICAR/10)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Sustainable energy systems at the building and urban scale	IIND-07/B (ex ING-IND/11)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Lighting Technology	IIND-07/B (ex ING-IND/11)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	First
Innovative Building Technologies	CEAR-08/A (ex ICAR/10)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second
Architectural and Building Acoustics	IIND-07/B (ex ING-IND/11)	single	9	72	Frontal lesson	In-person	C	Related or Supplementary	Second

For the course of your choice among all the exams offered at the University the recommended options for automatic approval of the Study Plan are:

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities** *(lectures, workshops, etc.)*	**Course Modalities** *(in-person, by distance)*	**TAF**	**Disciplinary area**	**Semester**
Environmental Sustainability of Materials	IMAT-01/A (ex ING-IND/22)	single	9	72	Frontal lesson	In-person	D	At the student's choice	Second
Limit analysis of structures	CEAR-06/A (ex ICAR/08)	single	9	72	Frontal lesson	In-person	D	At the student's choice	Second
Smart, resilient and sustainable city	CEAR-12/ (ex ICAR-20)	single	9	72	Frontal lesson	In-person	D	At the student's choice	First

ANNEX 2.1

DEGREE PROGRAM DIDACTIC REGULATIONS

BUILDING ENGINEERING FOR SUSTAINABILITY

CLASS LM-24

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Department: Civil, Building and Environmental Engineering (DICEA) - University of Naples Federico II

Didactic Regulations in force since the academic year 2025 - 2026

Course: Geotechnical works for construction		**Teaching Language:** Italian
SSD (SUBJECT AREAS): CEA-05/A (ex ICAR/07)		**CREDITS:** 9
Course year: I	**Type of Educational Activity: B**	
Teaching Methods: in person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Course content includes: modelling the physical-mechanical behaviour of natural soils and their interaction with geotechnical works; analysis and design of geotechnical works such as foundations and retaining structures.		
Objectives: The course aims to provide the knowledge to carry out finite applications in the field of Geotechnical Engineering, analysing problems of geotechnical works functional to the statics of buildings. In particular, students will be able to develop the geotechnical model of the subsoil, based on site investigations and laboratory experimentation, and try their hand at the dimensioning and verification of surface foundations, piles and support works, in accordance with NTC2018.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Oral test on topics discussed during lectures and exercises		

Course: New Strategies of Territorial Government	**Teaching Language:** Italian
SSD (SUBJECT AREAS): CEAR 12/A (ex ICAR/20)	**CREDITS:** 9
Course year: I	**Type of Educational Activity: B**

Teaching Methods:
in person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
The teaching programme, with reference also to the SSD CEAR 12/A, aims at deepening the issues related to the near future urban challenges that today's cities are called to adopt strategies to govern the transformations both to respond to the new evolutionary, demographic, technological, social and urban accessibility needs (such as the constant growth of the urban population the accelerated ageing of the population, the development of the Smart City, universal accessibility to urban places and services, active participation in urban decisions), and to curb phenomena that can compromise the quality and liveability of cities (such as heat islands, energy consumption, vulnerability to natural and anthropogenic risks, air and noise pollution, pandemics).

Objectives:
The main objective is to provide students not only with a deeper theoretical and methodological understanding of the complexity of urban systems, but also with a specific knowledge of the main current trends and the necessary innovations to be introduced in the process of governing urban and territorial transformations. This aim, in addition to reinforcing the educational objectives of the entire course of studies, is to be framed within the framework of the practices and experiments necessary for the training of an updated professional figure capable of supporting public decision-makers in making sustainable choices capable of increasing the liveability and resilience of the city and its territory.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Oral exam

Course: Responses of structures to seismic and climatic hazards		**Teaching Language:** Italian
SSD (SUBJECT AREAS): CEAR-07/A (ex ICAR/09)		**CREDITS:** 9
Course year I	**Type of Educational Activity: B**	

Teaching Methods:
in person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
The contents of the SSD declaratory consist of theories and techniques aimed at both the structural conception and design of new buildings, as well as the structural assessment and rehabilitation of existing ones. Therefore, they include the problems of actions on buildings and the resulting behaviors based on typologies and morphologies, materials and technologies, interaction with the ground and the environment, methods and strategies of use and control; assessments of vulnerability, reliability, comfort, safety and durability; methods and tools for structural design and construction of structures; experimentation, testing, monitoring of buildings. They include historical construction investigations, safety checks, and structural intervention solutions applicable to historic buildings and monuments.

Objectives:
The course aims to provide students with principles, methodologies, and tools for evaluating the response of structures under seismic action. It will also be considered exceptional actions from eruptions, floods, landslides, and hurricanes.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Oral test with discussion of the theses.

Course: Building systems elements and planned maintenance	**Teaching Language:** Italian
SSD (Subject areas): Management Of System Design CEAR-08/A (ex ICAR/10) Scheduled Maintenance CEAR-08/B (ex ICAR 11)	**CREDITS:** 6 + 6
Course year: I	**Type of Educational Activity: B**

Teaching Methods:
in person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:

Scheduled Maintenance

the problems addressed therefore concerns technological aspects of the design, construction, diagnostics, maintenance and transformation of new organizations and systems or objects of recovery, with the purpose of obtaining a building production that expresses compatibility between project purposes and requirements regulations, quality controls and performance, organizational needs, and to achieve a planned life cycle and controlled aging of the works

Management Of System Design

technical systems in the uni code classification and terminology of the technological system used. characteristics and problems common to all building-plant technological units. graphic representation, purpose and modeling of installation systems. typical graphics of a system project with relative reading of contents

Objectives:

the course aims to provide students with the necessary notions to be able to manage existing and newly constructed buildings - with reference to the building-installation system - during their lifetime, especially according to the most advanced methodological approaches and otherwise compliant with current regulations , mandatory and voluntary, starting from a preliminary step of in-depth on the diagnosis, to give students the ability to identify the causes of degradation, in act or predictable in the future.

the module dedicated to systems develops an integrated educational objective between the disciplines of technical architecture and technical physics in order to explain the problems relating to the relationship between project setup, construction technique and technical building systems, with particular reference to environmental quality of construction, to ensure that the choice of building technologies is in relation to environmental, architectural and economic needs

Propaedeuticities:

None

Is a propaedeuticity for:

None

Types of examinations and other tests:

Oral test with discussion of the year's paper

Course: BIM and Coordination Management for Building Construction	**Teaching Language:** Italian
SSD (Subject areas): CEAR-10/A (ex ICAR-17)	**CREDITS:** 9
Course year: I	**Type of Educational Activity: B**

Teaching Methods:
In-person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
In-depth study of digital survey data management methodologies. Development and management of digital data and models for ex novo design and management of existing buildings. Methodological and operational tools for parametric BIM modelling. Tools and methods for multidisciplinary modelling and for the coordination of parametric models. Multi-scalar project coordination data management.

Objectives:
To increase knowledge in the field of parametric modelling and digital representation of building artefacts through approaches oriented towards Business Intelligence and Information Management actions - also through a complementary deepening of digital survey techniques and acquiring the methodologies of data integration up to the simulation of the intervention on the building heritage. To provide specialist notions and the methodological and operational tools for coordination and project management through the critical use of parametric BIM modelling understood as an overall system of cognitive acquisition, development and management of information for the design from scratch and the management of existing buildings

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
The examination consists of an oral test with the discussion of a project paper. The final grade will be single and weighted on the total 9 CFU. The examination will assess the exposition and application of theoretical concepts in the discussion of a project paper, summarising the survey and parametric modelling activities of an existing artefact, identified as a case study for the year's topic, with theoretical questions on the remaining parts of the teaching programme.

Course: Energy efficiency of the building and climate control systems	**Teaching Language:** Italian
SSD (SUBJECT AREAS): IIND-07/B (ex ING-IND/11)	**CREDITS:** 9
Course year: I	**Type of Educational Activity: B**

Teaching Methods:
In person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
The contents include skills relating to the following topics: thermodynamic, thermokinetic analysis of energy processes and their environmental impact, principles, methodologies and technologies for sustainable energy conversion from renewable and conventional energy sources, final uses of energy, energy management, techniques for monitoring and processing energy data and models, energy efficiency technologies and applications, thermoeconomic, technologies for the energy transition, physics of the built environment, with particular reference to the interaction among occupants and the environment, thermophysics of buildings, technical plants for civil applications, energy diagnosis and optimization of the building-plant-territory system, air quality, passive systems and plant technologies for air conditioning and environmental well-being. It also studies refrigeration technologies, thermotechnics, heat exchange and energy storage systems and components, thermophysical properties of materials, materials for energy.

Objectives:
The course aims to provide knowledge of the main characteristics of the building-plant system, enabling students to optimize the thermal-hygrometric interactions between the building and the external environment, to design the air conditioning systems and predict the best placement of the various equipment inside and outside the buildings.
The necessary indications are also provided for the development of a building-plant system project compliant with current regulations relating to energy saving in buildings, in order to achieve one or more of the following targets: nZEB (nearly Zero Energy Building), NZEB (Net Zero Energy Building), ZEB (Zero Emission Building).

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
The exam will take place taking inspiration from project documents based on case studies previously designed by students and continuing with the oral exam.

Course: Urban marketing and real estate valorization	**Teaching Language:** Italian
SSD (SUBJECT AREAS): Estimo e valutazione CEAR-03/C (ex ICAR/22)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: B**

Teaching Methods:
In presenza

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
Appraisal and Valuation develops methodologies for the evaluation of programmes/plans/projects and for the estimation of the economic value of assets and rights and of returns in public and private decision-making processes. The discipline includes both economic and financial analysis techniques (ACR and ACB) for evaluating the private and social value of investments in the construction, civil, industrial, environmental and energy fields over the entire life cycle of the assets, and integrated and systemic approaches (ACB and AMC), also supported by spatial analysis techniques, for environmental and economic-social evaluations of programmes/plans/projects on natural and territorial resources, historical-architectural and landscape assets, in a sustainable development logic.

Objectives:
The course aims to provide students with theoretical knowledge and specialized operational methodologies related to Real Estate Appraisal and Economic Evaluation of Urban-scale Real Estate Enhancement Projects. It delves into topics such as the valuation of real rights and related limitations, expropriations for public use, and public procurement. A fundamental part of the course is the seminar-level presentation of various case studies, which adequately exemplify the different methodologies addressed.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Final exam is oral only, with a grade expressed on a scale of thirty

Course: Sustainable Urban Project	**Teaching Language:** Italian
SSD (Subject areas): CEAR-09/A (ex ICAR/14)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: B**

Teaching Methods:
in-person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
The contents of the course refer to the architectural project, in its extension from the detail to the urban dimension, as a process and moment of synthesis. They are divided into methodological aspects, concerning the theories of contemporary design; analytical-instrumental, for the study of the distributive, typological, morphological, linguistic characteristics of architecture and the city; compositional, concerning the aggregative and formal logic with which the organism defines itself in its elements and parts and relates to its context; design, for the solution of specific issues relating to interventions ex novo or on the built.

Objectives:
The course aims to acquire specialist skills in urban design and has as its object the learning of the theory, technique and tools for the design of buildings in relation to their use, spatial and formal qualities, and relations with the urban context to which they belong.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Project document

Course: Timber construction	**Teaching Language:** Italian
SSD (SUBJECT AREAS): CEA-07/A (ex ICAR-09)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
In presence

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
Timber and timber based materials in constructions. Solid timber as structural material: physical and mechanical features. Solid structural timber grading according to strength and strength grades. Glulam and CL timber: the production process, mechanical properties and strength grades. Timber based products. Strength checks of cross sections. Buckling check of structural elements. Deformability checks. Structural elements of particular shapes. Composite beams and columns. Traditional carpentry joints and joints with cylindrical metal fasteners. Timber structural systems Seismic resistant structures. Ancient timber structures: structural safety evaluation and retrofitting interventions compatible with conservation requirements. National and European standards framework. Durability and protection issues. Behavior under fire. Design of an industrial building made of timber.

Objectives:
Provide deep knowledge about the physical and mechanical features of timber as structural material (both solid, glulam and CL timber), the structural systems and safety evaluation, for new and existing buildings, in the framework of European and national standards.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Oral exam

Course: Structures for high-rise and long-span buildings	**Teaching Language:** Italian
SSD (Subject areas): Structural Engineering CEAR-07/A (ex ICAR/09)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
in-person - theoretical lectures, exercises and tutoring activities, seminars.

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
The aim of the course is to provide the student with skills useful for the design of structures for tall buildings in steel, reinforced concrete or mixed/hybrid, with particular emphasis on the conceptual phase and sizing process of the global system and of the single elements.

Objectives:
The aim of the course is to introduce the topic of large structures, providing students with advanced concepts of design, modelling and structural analysis in order to: (1) identify and understand the functioning of the different types of high rise and large span buildings; (2) identify the load path and the resisting mechanisms of structural systems; (3) to employ simplified schemes and methods, both to evaluate the overall behaviour in a preliminary design phase and to check the results obtained with refined analysis methods. Although the course is concentrated on structural design, the interaction with formal, architectural, technological and mechanical aspects is emphasized, as well as the role of these artifacts in the urban context. For this reason, an integrated and multidisciplinary approach is suggested in the development of the student final work to be prepared for the exam, that is, at the student's choice: a building project, the analysis of a case study, an essay on a theoretical topic.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
oral exam with discussion of the student final work, that is, at the student's choice: a building project, the analysis of a case study, an essay on a theoretical topic.

Course: Diagnosis and Therapy of Structural Failures		**Teaching Language:** Italian
SSD (Subject areas): CEAR-07/A – Tecnica delle Costruzioni		**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**	
Teaching Methods: In-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: Actions on structures; structural behaviour under varying their type, geometry, materials, techniques, technologies, and interaction with soil and environment; vulnerability and safety assessment; experimental testing, proof checking and structural health monitoring; safety checks and structural retrofitting of historical constructions and monuments.		
Objectives: (i) To provide criteria and methods for structural assessment through analysis of structural failures and their causes, with the aim of risk mitigation and forensic engineering. (ii) To deliver fundamentals of structural repair under different conditions (emergency or normal) through alternative techniques (classical or innovative; local or global).		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Oral test		

Course: Reinforced Concrete Buildings.	**Teaching Language:** Italian.
SSD (Subject areas): CEAR-07/A (ex ICAR/09)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
In-person.

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
The contents of the SSD declaratory consist of theories and techniques aimed at both the structural conception and design of new buildings, as well as the structural assessment and rehabilitation of existing ones. Therefore, they include the problems of actions on buildings and the resulting behaviors based on typologies and morphologies, materials and technologies, interaction with the ground and the environment, methods and strategies of use and control; assessments of vulnerability, reliability, comfort, safety and durability; methods and tools for structural design and construction of structures; experimentation, testing, monitoring of buildings. They include historical construction investigations, safety checks, and structural intervention solutions applicable to historic buildings and monuments.

Objectives:
The course aims to provide to students with the principles, methodologies, and tools for the structural design of new R. C. buildings in seismic areas and for the assessment of static and seismic safety of existing R.C. buildings.

Propaedeuticities:
Not any.

Is a propaedeuticity for:
Not any.

Types of examinations and other tests:
Oral test with discussion of the structural projects.

Course: Design of steel sustainable structures	**Teaching Language:** Italian
SSD (Subject areas): Structural Engineering CEAR-07/A (ex ICAR/09)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:

in-person - theoretical lectures, applicative and tutoring activities dealing with the development of a project, seminars.

Contents extracted from the SSD declaratory consistent with the training objectives of the course:

The aim of the course is to provide the student with skills useful for the design of steel structural systems for multi-story buildings, with particular emphasis on the conceptual phase and sizing process of the global system and of the single elements.

Objectives:

The course intends to provide students with the basic knowledge and methodological tools necessary to: (i) conceive different structural steel typologies for multi-storey buildings; (ii) use simplified schemes and approaches, both to evaluate the overall behaviour in a preliminary design phase and to verify the results obtained with refined analysis methods. Although the course focuses on structural design, the interaction with formal, architectural, technological, and mechanical aspects, as well as with the urban context, is emphasised.

The aim of the course is to transmit to students the ability to manage and organize the knowledge and methodological tools acquired to solve "open" design problems relating to steel buildings, i.e.: conceiving multiple structural solutions, analysing their behaviour, both in simplified and through sophisticated calculation tools, and to comparatively evaluate their efficiency. Furthermore, the maturation and re-elaboration of the knowledge acquired during the course allow the student to manage interactions with other design disciplines, and to use them as a starting point for innovative and integrated solutions.

Propaedeuticities:

None

Is a propaedeuticity for:

none

Types of examinations and other tests:

written and oral exam, with the discussion of the project (concerning the structural system of a multi-story building in seismic zone)

Course: Urban regeneration and adaptation to climate change	**Teaching Language:** Italian
SSD (SUBJECT AREAS): CEAR-12/A (ex ICAR/20)	**CREDITS:** 9
Course year: II	**Tipologia di Attività Formativa: C**

Teaching methods:
In person

Contenuti estratti dalla declaratoria del SSD coerenti con gli obiettivi formativi del corso:
Under the theoretical-methodological basis that the course aims to transfer, students will demonstrate their ability to understand the dynamics underlying the transformations of cities and territories, also in the light of the challenges they will face in the decades to come.
Furthermore, methods, techniques and tools will be presented that have been developed to design solutions capable of meeting these challenges, and that are necessary for the governance of urban transformations through a systemic vision that is capable of restoring the complexity of urban and territorial phenomena.

Objectives:
The course of Urban Regeneration and Adaptation to Climate Change is aimed, on the one hand, at the completion of the fundamental contents of the discipline of Urban Planning Technology and, on the other hand, at the deepening of innovative contents that significantly characterise the discipline. In particular, through face-to-face lectures, thematic seminars and application-laboratory activities, students will deepen the issues related to urban sustainability, the challenges posed by climate change, including heat islands and the increase of social and physical vulnerability of urban areas, and the regeneration of the existing heritage (at the urban scale). Through a strongly practice-oriented approach, teaching will explore each topic by illustrating to students the phenomena affecting cities, the scientific methodologies developed to measure their effects on urban settlements, and some best practices implemented internationally.

Propaedeuticities:
None

Is a propaedeuticity for:
none

Types of examinations and other tests:
Oral examination and discussion of the work

Course: Territorial Information Systems		**Teaching Language:** Italian
SSD (Subject areas): CEAR-12/A (EX ICAR/20)		**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**	
Teaching Methods: in-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The scientific-disciplinary contents involve the analysis and evaluation of urban and territorial systems, examined in their environmental context and within the framework of the natural and human-induced risks they are subject to, as well as the socioeconomic variables by which they are influenced. The techniques for planning tools at all scales.		
Objects: The main objective of the course is to provide students with not only a deeper theoretical and methodological understanding of the knowledge and complexity of urban and territorial systems, but also specific technical skills in the design and implementation of geographic information systems (GIS) to study spatial phenomena and support decision-making processes in managing urban and territorial transformations.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: The exam includes an oral test and the discussion of a project work.		

Course: Building recovery project	**Teaching Language:** Italian
SSD (Subject areas): CEAR-08/A (ex CIAR/10)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
In person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
Survey of the construction techniques of masonry buildings from classical antiquity to the second post-war period: materials procurement, transport, implementation. Theoretical approach to the project of restoration and restoration of buildings through the reasoned reading of the main international maps of restoration. Evolution of the concept of landscape, from the Italian constitution to the current norms and international criteria for its valorization. Cultural landscapes UNESCO. Diachronic vision of the concept of protection of the built landscape in relation to the economic and social conditions and the prevailing norms.Masonry, natural stone and artificial stone constructions Main construction methods.The behaviour of buildings in masonry bearing. Static checks of structural elements in masonry. Static dissesti of arches, vaults, domes. Typology of arches and vaults. Stability and theories on the balance of masonry arches. Static dissesti in buildings. Main types of disturbances in buildings. Causes of disturbances. Injuries. Cracking pictures. Analysis and diagnosis of disturbances.Concept of degradation. Representative methods. NorMaL recommendations. UNI standards. International standards bodies ISO and CEN.Manual material survey. Examples of surveys carried out with laser scanners. Thermography. DIAGNOSIS OF STRUCTURES. Direct surveys and indirect surveys. Choice of survey techniques according to the properties of the structure that need to be known and identification of survey techniques that can be used for this purpose. Methodology of approach to the project: preliminary studies, direct and indirect on-site analyses, cracking pictures and analysis of dissects, preliminary instrumental diagnostics. Design criteria for maintenance, conservation, building and urban renovation, seismic improvement, energy improvement: arrangements

Objectives:
The aim of teaching is to provide students with the knowledge necessary for setting up a project for the rehabilitation and functional enhancement of existing buildings in relation to resources, the local constructive culture, national and international standards and recommendations, and functional, economic and social needs. To put students, especially those who have reached the end of their training course, directly in contact with professionals working in the sector such as specialized construction companies, Design firms, Ministry of Culture, municipal offices.

Propaedeuticities:
the knowledge of the principles of the science of the environment construction, geology, building materials; a medium knowledge of history of art and architecture

Is a propaedeuticity for:
none

Types of examinations and other tests:
Oral test only, with discussion of the project papers

Course: Design and Consolidation of Masonry Structures	**Teaching Language:** Italian
SSD (Subject areas): CEAR-07/A (ex ICAR/09)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
In person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:

Introductory notions: Construction types, standards, structural models, geometric modelling of regular and irregular walls, action models, peculiarities of the seismic response of masonry buildings (local and global response, role of decks and connections).

Elements of earthquake engineering: Limit states, nominal life, use classes, reference period, modelling of seismic actions (hazard, simple oscillator dynamics, elastic and design spectra).

Mechanical modelling of materials: test methods, strengths, elastic characteristics and constitutive bonds of stone elements (natural and artificial), mortars and masonry.

Structural analysis of masonry buildings subject to gravitational loads and non-seismic horizontal actions: Geometrical models, action models, eccentricity of loads, safety verifications. Modelling of masonry walls subjected to horizontal seismic actions: Macro-element modelling, types of crises in the wall plane, resistance domains of male panels (press-flexion, tensile shear, creep shear), resistance domains of fascia panels (simple and reinforced), force-displacement characteristic curves of male and plane panels.

Analysis for local seismic actions: Out-of-plane collapse mechanisms, macro-block and simplified models, linear static analysis, linear and non-linear kinematic analysis, safety checks.

Linear static seismic analysis: Shear at the base and its distribution along the height, distribution of horizontal seismic plane actions, normal stresses induced by horizontal actions, verification of tongue and groove panels, stresses in node and fascia panels, verification of fascia panels.

Load-bearing capacity analysis of hollow walls: Incremental static analysis in force control of regular and irregular walls, crisis multiplier at damage limit states and safeguarding of life.

Non-linear static seismic analysis (pushover): Advanced macro-element modelling (non-linear constitutive bonds, deformation limit states, characteristic curves in deformation control, crisis criteria), incremental static analysis in force and displacement control, capacity curves, definition of the equivalent simple oscillator with elasto-plastic bond, seismic demand assessment, structure factor estimation, safety checks in terms of displacement.

Analysis of arches and vaults: Types of construction, behaviour of isostatic and hyperstatic arches, characteristics of internal stress, theory of the ellipse of elasticity, calculation of thrust and thrust fall, three-hinged arch, two-hinged arch, eliminated-thrust arch, embedded arch.

Consolidation of masonry structures: Simple and reinforced injections, reinforced walls, column hooping, chaining and tie-rods, reinforced concrete kerbs, flatbeds, stiffening of wooden floors, external reinforcement with organic (FRP) or inorganic (FRCM) matrix fibre-reinforced materials.

Structural design or assessment of a masonry building located in a seismic zone (each exercise deals with a state of progress of the design or assessment)

Objectives:

The course aims to provide the general criteria and methods for the simulation of the structural behaviour of masonry buildings, which constitute a high fraction of the Italian and global built environment. The course covers both the design of new buildings located in seismic zones and the structural assessment and consolidation of existing masonry buildings.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Project work

Course: Regenerative Architectural Design	**Teaching Language:** Italian
SSD: Composizione Architettonica e Urbana CEAR-09/A (ex ICAR/14)	**CREDITS:** 9
SSD (Subject areas): II	**Tipologia di Attività Formativa: C**
Teaching methods: in person	

Contents extracted from the SSD declaratory consistent with the training objectives of the course:

In the disciplinary scientific group [converges] Architectural and Urban Composition [...] with the scientific contents of the architectural project [...] in their theoretical-critical, methodological, ideational, applicative and experimental articulation. The group recognises the contemporary dimension of architectural, urban and landscape contexts as a material and immaterial, complex and stratified reality. The group [...] identifies in the project the inter-scalar and inter-disciplinary synthesis between its own knowledge and the humanistic and technical-scientific knowledge that contribute to the knowledge, interpretation and modification of the physical and social environment. The group assumes the architectural project as an intellectual and scientific product and process, an expression of the action of formal, technical and spatial experimentation, and as a peculiar tool for the training of designers [...].

The [...] training activity concerns the theoretical, critical and technical dimension of the design of architectural and urban spaces, buildings, places, landscapes and of the form of their evolution in the anthropic and natural components; it identifies the ways of intervention for the transformation of contexts and heritage; it defines the quality of the architectural project on new and existing buildings pursuing technical, formal and relational appropriateness in the tension towards beauty, experimenting with innovative principles of sustainability and compliance, in relation to the environment, economy and society.

Architectural and Urban Composition deals with: the form and space of the building and the city in relation to the needs of man, society and the environment; compositional-designing aspects related to expressive codes and techniques of ex-novo intervention and transformation of the historical and contemporary built heritage; it defines the formal, constructive and settlement characteristics and logics of the architectural figure, in full and empty spaces, in relation to the urban and natural context, to infrastructures and to the territory.

Architectural and Urban Design is an inter-scalar discipline that works on the ways of constructing the form of architecture, the city and the territory, in relation to the contemporary needs of man, society and the environment; it investigates expressive codes and intervention techniques, relating to other disciplines, from the human sciences to the technical-scientific ones.

The scientific-disciplinary contents are divided into: methodological aspects concerning the theory of design; analytical-instrumental aspects relating to the study of the distributive, typological, morphological, spatial and linguistic characteristics of architecture and the city; compositional-designing aspects, concerning the formal and settlement logic of the elements and parts in relation to the architectural figure and places, the urban and natural context, the infrastructures and the territory. The contents refer to the design of ex-novo interventions and transformation of historical and contemporary heritage, in their various constructive and technical aspects. The didactics exercises the project as experimentation and verification of the theoretical-methodological reflection on architecture and the city.

Objectives:
The course is aimed at students of the Master's Degree Course in Building Engineering and aims to provide the ability to design an architecture that is properly suited for the environmental crisis era. During the course, students will develop an architectural project taking into account the specific conditions of the context and the available environmental resources (water, sun, wind, biomass), remedying the damage caused to the ecosystem with energy/bioclimatic solutions (zero-energy and zero-carbon: use of natural resources for passive cooling and architectural integration of renewable energy production systems), by increasing local biodiversity (architectural integration of ecosystems) and through a linguistic update focused on the concept of civilization-biosphere symbiosis. The course also aims to empower transversal skills, such as independent judgement, the ability to fully communicate and illustrate the project and the concepts that inform it, awareness of one's role as a competent and responsible professional in complex contexts, also and above all in relation to the complexity of the issues posed by the ecological crisis.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
The final examination is the presentation and critical discussion of the project exercises developed during the course, with particular reference to the design choices, the methodologies followed, and the congruence of the various technical and formal aspects.

Course: Building technology design	**Teaching Language:** Italian
SSD (Subject areas): CEAR-08/A (ex ICAR/10)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
in presence

Contents extracted from the SSD declaratory consistent with the training objectives of the course:

The scientific-disciplinary contents of the Course in Technological Design for Buildings for building engineering students have as subject the built environment in its various articulations and are aimed at providing tools, methods, models for knowledge and design, from a critical, systemic, functional, typological, technical and constructive point of view.

They include the study of issues related to the performance of existing heritage and new buildings, technological solutions, complex systems for the identification of intervention scenarios, processes, tools and models for the safety, resilience and sustainability of the built environment.

In particular, the contents concern: construction system techniques; construction technologies; design, experimentation and innovation of materials, components and systems; integral design of buildings; analysis of building performance and buildings' environmental impact; analysis and quality control of design and works.

Objectives:

The course aims to train the student in the specialised and in-depth design of the building complex, developed since a specific critical-performance, constructive and normative analysis of the Technical Elements that compose it.

The course is divided into 4 main modules, supplemented by in-depth seminars conducted by researchers, professionals, companies and operators in the construction market, experts in the sector.

- The first module is aimed at an in-depth knowledge of construction materials.
- The second module is aimed at breaking down the building into its constituent elements up to the classification of Technical Elements.
- The third module is aimed at the design of the technical elements by means of specific performance analyses and the use of specific software, also developed in consultation with industry experts and manufacturers, as well as based on the regulatory framework and market consultation.
- The fourth module relates to the execution phase and analyses construction techniques.
- The In-depth Seminars focus on the specific topics of design, execution, market consultation and the choice of materials, products and technologies, including innovative ones.

Propaedeuticities:

None

Is a propaedeuticity for:

None

Types of examinations and other tests:

The examination consists of a single oral test focusing on the ability in the critical and design application of the course contents.

Course: Sustainable energy systems at the building and urban scale	**Teaching Language:** Italian
SSD (Subject areas): IIND-07/B (ex ING-IND/11)	**CREDITS:** 9
Course year: I	**Type of Educational Activity: C**

Teaching Methods:
In person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
Thermodynamic, thermokinetic analysis of energy processes and their environmental impact, principles, methodologies and technologies for sustainable energy conversion from renewable and conventional energy sources, final uses of energy, energy management, techniques for monitoring and processing energy data and models, energy efficiency technologies and applications, thermoeconomic, technologies for the energy transition, physics of the built environment, with particular reference to the interaction among occupants and the environment, thermophysics of buildings, technical plants for civil applications, energy diagnosis and optimization of the building-plant-territory system, air quality, passive systems and plant technologies for air conditioning and environmental well-being. Refrigeration technologies, thermotechnics, heat exchange and energy storage systems and components, thermophysical properties of materials, materials for energy

Objectives:
At the end of the course, the student will know the fundamental principles and methods for the design of sustainable buildings and urban conglomerates, with zero carbon emissions (Zero Energy Buildings, ZEB and Communities, ZEC). The course aims at providing students with theoretical knowledge and fundamental tools for the design of energy efficient buildings and urban contexts resilient to climate changes and designed to promote the adoption of renewable energy sources, preferably based on technologies integrated into the building envelope and the urban context, as well as further strategies and solutions for energy efficiency. Aspects relating to the energy and environmental certification of buildings will also be explored.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
Oral exam with discussion of a project

Course: Lighting Technology	**Teaching Language:** Italian
SSD (SUBJECT AREAS): IIND-07/B (EX ING-IND/11)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**
Teaching Methods: In person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: With regard to applied thermodynamics and building physics, the group includes skills related to the physics of the indoor environment, with particular reference to occupant-environment interactions and lighting technology. It also studies the thermophysical properties of materials, thermo-fluid dynamic measurements and adjustments, materials for energy, acoustics and lighting technology.	
Objectives: Aim of this course is to allow students to acquire acknowledgments regarding the most innovative techniques concerning lighting systems. Moreover, the effects of lighting systems on humans and on the environment will be dealt with. The students will learn methodologies for developing lighting projects, also fruitfully cooperating with other professionals involved in the built environment design.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Oral exam and lighting project discussion	

Course: Innovative Building Technologies	**Teaching Language:** Italian
SSD (Subject areas): CEAR-08/A (ex ICAR 10)	**CREDITS:** **9**
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
in-person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:

The educational path outlined in the teaching aims to provide students with knowledge of innovative materials, technologies and strategies with regard to applicability in the field of architectural design of the building, as part of the environmental context.
Students are able to acquire an architectural-engineering approach, from the urban scale to detailed solutions, to know and master the use of new technological solutions and innovative strategies. These will enable them to develop a design model oriented toward a higher quality of living and geared to ensure the protection of natural resources and the environment, in line with current European and international action programmes.

Objectives:

The course aims to provide students with technical information, tools and methods that will allow them to access the design, both new and existing, with an up-to-date technological training and more aware of the contributions and potential of innovation. This knowledge will also allow students to develop a design approach aimed at minimizing environmental impact, attentive to climate implications and available natural resources, in order to create comfortable, sustainable and efficient buildings.

Propaedeuticities:

None

Is a propaedeuticity for:

None

Types of examinations and other tests:

Oral exam with project presentation

Course: Architectural and Building Acoustics	**Teaching Language:** Italian
SSD (SUBJECT AREAS): IIND-07/B (ex ING-IND/11)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: C**

Teaching Methods:
In person

Contents extracted from the SSD declaratory consistent with the training objectives of the course:
Skills relating to applied acoustics, physics of the built environment, with particular reference to the interaction among occupants and the environment, techniques for monitoring and processing acoustic data. It studies materials for noise and sound control as well.

Objectives:
The main goal of the course is to provide students with expert knowledge for analysing acoustic phenomena related to the propagation, description and perception of sound as well as the use of traditional and innovative materials for noise control. Students will acquire tools for studying, modelling and evaluating the sound field both outdoor than in small and large rooms, as well as technologies for improving acoustic insulation in buildings. Finally, issues concerning with the measurement and the analysis of the sound emitted by different types of sound source will be explored as well as design elements for improving the listening quality in rooms.

Propaedeuticities:
None

Is a propaedeuticity for:
None

Types of examinations and other tests:
The examination consists of a written test and an interview. The admission to the interview is not related to the written test. The latter is aimed at assessing the student's ability to practically use the conceptual, methodological and operational tools learned during the course by tackling specific application problems. In the final grade of the student, the written test and the oral exam account for 40% and 60% respectively.

Course: Environmental Sustainability of Materials		**Teaching Language:** Italian
SSD (Subject areas): IMAT-01 (ex ING-IND/22)		**CREDITS:** 9
Course year: II	**Type of Educational Activity: D**	
Teaching Methods: in-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: 1) Environment and anthropic activity: use of raw materials and energy sources to produce materials, with reference to the related environmental impact problems. 2) Environmental sustainability of materials: evaluation of the impact of the production, use and disposal of inorganic materials on the environment, with reference to the problem of the use of non-renewable energy sources. Use of tools for the implementation of the LCA (Life Cycle Assessment) of a material. 3) Materials and environment: use of materials in Energy Harvesting, Energy Storage and Environmental Protection processes. In addition to the institutional part, seminars held by external experts are planned.		
Objectives: The course aims to provide students with advanced information on sustainability of materials and environmental impact assessment. The principles of sustainability and sustainable development will be introduced, as well as their application to material production and processing strategies. The criticality of currently available resources will be explored, as well as the opportunity to recycle materials. Finally, different methods for sustainability assessment will be presented and studied, along with a series of case studies.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Project discussion. Oral examination.		

Course: Limit analysis of structures		**Teaching Language:** English
SSD (Subject areas): CEAR-06/A (ex ICAR/08)		**CREDITS:** 9
Course year: II	**Type of Educational Activity: D**	
Teaching Methods: in-person		
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The course provides an introduction to the evaluation of the collapse load of ductile structures under small displacements and to the evaluation of the collapse load on account of the loss of shape for non-linear structures. In particular, the following topics are covered: inelastic behavior of materials; laws of plastic flow; fundamental theorems of plasticity and of the limit analysis of structures; Eulerian instability; critical load and post-critical behavior; collapse due to loss of shape; instability in the inelastic field.		
Objectives: Knowledge of the general principles and methods for evaluating the load-bearing capacity of structures in elastoplastic and non-linear regimes.		
Propaedeuticities: None **Is a propaedeuticity for:** None		
Types of examinations and other tests: Oral interview		

Course: Smart, resilient and sustainable city	**Teaching language:** English
SSD (Subject areas): CEAR-12/A (ex ICAR/20)	**CREDITS:** 9
Course year: II	**Type of Educational Activity: D**
Teaching Methods: in-person	
Contents extracted from the SSD declaratory consistent with the training objectives of the course: The main teaching aim is the integration of approaches, models and methods to study city sustainability, resilience and smartness, by considering it as a dynamic and complex spatial system. This perspective allows to identify a panel of sustainable actions to adapt the city to the current and future challenges.	
Objectives: The aim of teaching is the integration of approaches to the study of city safety, understood as a dynamic and complex spatial system, which allows identifying a panel of sustainable actions capable of reducing the risk levels at which urban systems are currently exposed. Urban resilience is connected to the possibility that the city, in the face of one or more external agents, is able to counteract an opposite reaction (resilient), safeguarding the safety of the inhabitants, maintaining its own levels of organization, protecting the stock existing building, allowing the continuation of existing activities.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Oral exam and project discussion	

ANNEX 2.2

DEGREE PROGRAM DIDACTIC REGULATIONS

BUILDING ENGINEERING FOR SUSTAINABILITY

CLASS LM-24

School: Politecnica e delle Scienze di Base of University of Naples Federico II

Department: Civil, Building and Environmental Engineering (DICEA) - University of Naples Federico II

Didactic Regulations in force since the academic year 2025 - 2026

Training Activity: Internship/other knowledge	**Training Activity Language:** Italian
Content of the activities consistent with the training objectives of the course: training period to contribute to the achievement of the CdS objectives mainly related to the management, also with the aid of digital tools, of the design and construction processes of complex building systems and subsystems, integrating their functional, technological-plant, structural and geotechnical aspects	**CFU:** 6
Course year: II	**Type of Training Activity: F**
Teaching Methods: in-person	
Objectives: Internships or other activities to be carried out in public bodies, companies, professional firms, universities and research institutes, for students to learn innovative and applied methods and tools with reference to topics of their interest. Through this type of activity, students can come into contact with the world of work.	
Propaedeuticities: None **Is a propaedeuticity for:** None	
Types of examinations and other tests: Frequency	