

DEPARTMENT OF CIVIL ENGINEERING

PhD course in

Risk and sustainability in civil, architectural and environmental engineering systems

ACADEMIC REGULATIONS

Article 1 Scope

The present document illustrates the rules and regulations governing the PhD course in **Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems**, promoted and organised by the Department of Civil Engineering (DICIV) in accordance with Article 16 of the “University Teaching Regulations” and the “University Regulations on PhD Courses”, which govern all subjects not covered by the present regulations.

Article 2 Course objectives

The PhD course in **Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems** (hereinafter referred to as “the PhD course”) has as its primary objective the transfer of skills necessary to carry out highly qualified research and/or professional activities in the CUN 08 Scientific-Disciplinary Sectors.

The course aims to create professional figures endowed with the necessary expertise to work in the fields of scientific research, higher education and diverse professions.

The course objectives have a marked multidisciplinary imprint, with several disciplinary sectors coming together to develop research ranging across the CUN 08 Scientific-Disciplinary Sectors.

Skills are transferred through an in-depth study of curricular subjects and a thorough investigation of methodological and professional disciplines. In order to ensure maximum adaptability to the multiplicity of profiles required in the labour market, considerable importance is attached to team working, learning foreign languages, the willingness to transfer abroad, IT skills and the ability to manage interdisciplinary knowledge and applicable regulations.

Article 3 Research areas

The areas of interest for the PhD Course generally fall within the following Scientific-Disciplinary Sectors (SSDs):

- ICAR/01 - Hydraulics (08/A1)
- ICAR/02 - Hydraulic and Maritime Construction and Hydrology (08/A1)
- ICAR/03 - Sanitary-Environmental Engineering (08/A2)
- ICAR/04 - Roads, Railways and Airports (08/A3)
- ICAR/05 - Transport (08/A3)
- ICAR/06 - Topography and Cartography (08/A4)
- ICAR/07 - Geotechnics (08/B1)

- ICAR/08 - Construction Science (08/B2)
- ICAR/09 - Construction Technology (08/B3)
- ICAR/10 - Technical Architecture (08/C1)
- ICAR/14 - Architectural and Urban Composition (08/D1)
- ICAR/17 - Drawing (08/E1)
- ICAR/18 - History of Architecture (08/E2)
- ICAR/19 - Restoration (08/E2)
- ICAR/20 - Technology and Urban Planning (08/F1)
- ICAR/22 - Appraisal and Evaluation (08/A3)
- GEO/04 - Physical Geography and Geomorphology (04/A3)
- FIS/07 - Applied Physics (02/D1)
- MAT/05 - Mathematical Analysis (01/A)
- MAT/07 - Mathematical Physics (01/A)
- ING-IND/11 - Environmental Technical Physics (09/C2)
- ING-IND/27 - Industrial and Technological Chemistry (09/D3)
- MED/27 - Neurosurgery (06/E3)

The above areas fall within the scientific interests of the teaching and research staff who make up the Supervisory Board (pursuant to the Italian Ministry of Education, Universities and Research decree D.M. MIUR 94/2013, article 6 (4), hereinafter referred to as “The Board”) and can be developed in the various scientific and teaching laboratories at the Department of Civil Engineering (hereinafter referred to as “The Department”):

- Transport Systems Analysis Laboratory
- Technical Architecture Laboratory
- Bioengineering and Biomechanics Laboratory
- CAD-BIM 102 Teaching Laboratory
- Computing Teaching Laboratory
- Economic-Financial Appraisal and Assessment Laboratory
- Applied Physics Laboratory
- Geotechnics Laboratory
- Environmental and Maritime Hydraulics Laboratory
- Models Laboratory
- Architecture and Built Environment Design Laboratory
- History of Engineering and Architecture Laboratory
- Laboratory of Roads, Railways and Airports
- Materials and Structures Testing Laboratory
- Laboratory of Urban Planning Technology
- ReSLEHM Centre, Remote Sensing Laboratory Environment Hazard Monitoring.

Article 4 Curricula

The PhD Course in **Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems** offers the following two curricula.

- Curriculum A: Interventions and infrastructure for land protection, environmental systems and infrastructure

“Advanced technologies, infrastructure and land protection for sustainable development”.

(ICAR/01, ICAR/02, ICAR/03, ICAR/04, ICAR/05, ICAR/06, ICAR/07, ICAR/20, ING-IND/27, FIS/07)

The research areas of Curriculum A concern the study of natural phenomena and anthropic activities that may have a significant negative impact on the environment and/or the territory as well as the design of innovative solutions for impact mitigation and environmental protection. The specific nature of the issues involved means that these studies offer diverse applications, such as the design and management of monitoring systems and the identification and supervision of interventions aiming to mitigate impact and risks for the environment, the local area and the human community. In general, these applications entail technical-engineering solutions enabling optimal use and conservation of natural resources in order to protect and enhance the characteristic features of the local environment.

The course aims to train a professional figure endowed with scientific expertise, a thorough knowledge of the processes that regulate the origin and evolution of natural phenomena and human activities impacting the environment, as well as the ability to make environmental impact assessments and identify and design the most appropriate measures to protect and restore the environment. In particular, the course follows a multidisciplinary approach providing the scientific and technical knowledge needed in order to:

- observe and represent the physical characteristics of the natural and man-made environment through on-site surveys and remote measurements with a view to developing networks for monitoring pollution, environmental processes and local activities;
 - identify the problems specific to territorial systems in order to develop suitable management strategies through the study, analysis and mapping of the risks related to landslides, flooding and extensive erosion in large areas;
 - design, monitor and manage transport infrastructure while taking into account the risks and needs of the local area;
 - design activities for the mitigation and monitoring of natural and man-made risks, with structural interventions to ensure the hydraulic and geotechnical protection of the area and the constructions and works built on it;
 - evaluate environmental pollution and its impact in order to make design choices for plant engineering interventions and to identify environmental protection and mitigation measures;
 - design technologically advanced solutions for the management and monitoring of anthropic pressure on the environment and the recovery of natural resources and energy from waste streams.
- Curriculum B: Construction Engineering and Building and Urban Recovery

“Integrated assessment of the vulnerability of building stock: diagnostic protocols and conservation”.

(ICAR/08, ICAR/09, ICAR/10, ICAR/14, ICAR/17, ICAR/18, ICAR/22, ING-IND/11, MED/27, MAT/07).

The research areas of Curriculum B focus on the density of the existing building stock and its exposure to natural risks, with particular reference to seismic activity. Italy is certainly one of the countries that contribute most to the high-quality scientific development of building stock vulnerability analysis. However, a continuous updating of third level training activities in this field is desirable, through a PhD curriculum that provides skills and knowledge in step with the ongoing evolution of scientific knowledge and the relevant regulatory frameworks. While some aspects of this specific and complex discipline clearly fall within the competence of graduates of the various first- and second-level degree courses in the fields of engineering and architecture, there is often a lack of specifically trained technical and research professionals who can carry out highly

qualified field research and monitoring activities in both public and private bodies. Such figures must be able to coordinate the interdisciplinary nature of natural risk mitigation interventions, both at diagnostic and implementation level, with the aim of proposing globally integrated and sustainable protection.

Curriculum B is focused on the following specific skills (taught components), which involve numerous scientific-disciplinary sectors in the Department:

- techniques to appraise and investigate the current status of buildings, including an examination of relevant documentation, building traditions, construction materials available at the time, the physical environment, urban planning, the characteristic features of the territory in question, any geo-climatic or social variants that may have determined the technical choices, as well as human and natural activities. Particular emphasis is placed on knowledge of inspection techniques and instrumentation, the analysis of laboratory results and on-site tests, and the integration of data related to different techniques and materials;
- determination of the deterioration of structures and their architectural/artistic elements, including consolidated structural health monitoring techniques, structural identification, assessment of architectural surfaces, effects of climate change, human activity, chemical attack, flood damage, fires and earthquakes;
- criteria for estimating future deterioration/collapse mechanisms for different types of risks, including risk analysis methods, numerical methods and their validation, experimental validation, and the correlation between structural conditions and architectural elements;
- traditional methods of repair, restoration, improvement and conservation, including cost-benefits analysis and prioritising and optimising interventions at local and urban level;
- new conservation technologies, including new monitoring systems, anti-seismic technologies and new materials;
- theories, methods and techniques of architectural and urban design in critical and fragile contexts, including building and urban regeneration and recovery, in close collaboration with the other scientific-disciplinary fields envisaged in the PhD course.

Article 5 Course organisation

The PhD course is regulated through the *Study Plan*, the *Theoretical and Experimental Research Programme* (hereinafter referred to as the “Research Programme”) and the *Periodic Monitoring Procedure* (hereinafter referred to as the “Monitoring Procedure”).

The relationship between PhD students and Supervisors is regulated by the following procedure:

- at the beginning of the new PhD Cycle, the Board will assign a Supervisor to each PhD student, according to the criteria laid out in the University PhD regulations, taking into account the indications provided by the PhD student and in compliance with the curriculum chosen for the admission competition. The Supervisor will support the PhD student for the entire duration of the PhD course;
- the definition and implementation of the Study Plan and the Research Programme must be agreed jointly by the PhD student and the Supervisor;
- if the Supervisor is unable to complete his or her assignment, the Board will ensure that the PhD student is assigned a new Supervisor who will assist the PhD student in completing the Research Programme already in progress;
- following an explicit request from the Supervisor, the Board may assign a co-Supervisor to the PhD student in order to ensure that the latter receives the best support in developing the technical and scientific Research. The co-Supervisor will be chosen from: the teaching and research staff of Italian or foreign Universities; employees of public/private bodies of national or international importance; highly qualified

professionals;

- a PhD student can ask the Board to change Supervisor and/or the scientific-disciplinary field involved, choosing from the curricula specified in Article 4; the Board will decide whether to accept such a request. The approved change will be made starting from the course year following the one in which the request is submitted.

The PhD student's coursework and research are measured in University Credits (CFU): the completion of the course is subject to the achievement of **180 credits**, comprising coursework and research and regulated by Articles 5, 6 and 7.

Component	Credits (CFU)
Coursework	60
Research	110
Final examination	10
Total	180

Article 6 Coursework

The Board defines the annual plan and organisation of coursework. The coursework prescribed for PhD courses are classified as follows:

- Passive Learning, consisting of courses attended at Italian and foreign universities as well as specific learning activities organised by the Board on core subjects and specialised topics, envisaging a specialised and interdisciplinary final assessment;
- Foreign Language Learning, i.e. attendance of European language courses held at the University or in external organisations issuing certification recognised internationally and/or by the University of Salerno for the purpose of validating Foreign Language learning credits. Research and intellectual property enhancement activities are also carried out on a yearly basis as part of the PhD course;
- Seminars and independent learning activities performed by the PhD student over the three years of the course.

Article 7 Study Plan and Examinations

Study Plans are the tools used to schedule and validate PhD students' coursework:

- new PhD students must present their Study Plans to the Supervisory Board, within one month from the effective start date;
- PhD students must modify their Study Plans when so instructed by the Supervisory Board;
- all PhD students may submit a proposal for modifications to the Supervisory Board; if a proposal is rejected, the previously approved Plan remains valid;
- PhD students will be allowed to sit the final examination only after completing all the coursework provided for in their Study Plans. Study Plans specify three types of coursework (a, b and c) referred to in Article 6 and accounting for a total of 60 credits (CFU), normally concentrated in the first year of

the course and with the limitations illustrated in the following table.

Coursework	Credits (CFU)
a) Preparatory learning activities	$18 \leq a \leq 30$
b) Foreign language self-access laboratory	$b = 6$
c) Other seminar and independent learning activities, including the study of scientific and technical literature, attendance of classes and seminars organised by the PhD course and other independent learning activities certified by accredited national and/or international research institutions.	$c = 60 - (a+b)$
Total:	60

The examinations for all learning activities will be recorded in one of the following ways, as provided for in the university ESSE3 Information System:

- **Mark** (out of 30);
- **Approval** (*Pass/Fail*);
- **Suitability** (*Fit/Unfit*);
- **Assessment** (*Excellent/Very Good/Good/Fair/Sufficient/Insufficient*).

The examinations relating to the activities of types b) and c) will be carried out during the annual review of the PhD students' activities.

Article 8 Theoretical and Experimental Research Programme

The PhD student's research work accounts for 110 credits (CFU), with an extra 10 credits awarded for the final thesis.

Some of this research (minimum 3 months) must be carried out abroad with the Supervisor's oversight.

The Research Programme is the tool through which the Board approves, verifies and validates the development of the PhD students' research.

The PhD student must propose a Thesis Project agreed with the Supervisor and approved by the Board within the end of the first year.

The Research Programme must be congruent with this Thesis Project and must be submitted for Board approval by March 31.

All work contributing to the PhD must be expressed annually in CFU credits.

The PhD student, again in agreement with his/her Supervisor, may propose subsequent modifications to the Thesis Project and the Research Programme to the Supervisory Board, following the procedures illustrated in Article 9.

Article 9 Rights and duties of PhD students

The PhD course calls for an exclusive, full-time commitment, unless otherwise provided for in the University regulations.

PhD students may apply to the Supervisory Board for authorisation to perform, as an integral part of their educational project, tutoring and supplementary teaching activities for students of the bachelor's and master's degree courses. Such activities must not exceed a maximum limit of forty hours per academic year.

Article 10 Periodic Monitoring Procedure

PhD candidates' coursework and research are subject to evaluation by the Supervisory Board in accordance with a well-defined oversight procedure.

First, this procedure concerns the formulation and approval of the Study Plan and the Research Programme proposed by the PhD student and agreed with his/her Supervisor for each academic year:

- at the beginning of each academic year, the PhD student presents a Study Plan and a Research Programme (according to the procedures defined annually by the Supervisory Board), quantifying the relative workload in credits (CFU) and reporting the credits already verified and validated;
- the Board examines the PhD student's Study Plan and Research Programme within one month of their submittal, approving their contents or indicating any modifications needed;
- the PhD student may subsequently propose modifications to the Line of Research, again formulated in agreement with his/her Supervisor, by 31 October of the 2nd year of the PhD; requests for modifications must be accompanied by an overview of the credits from coursework and research already carried out and the number of research credits considered useful for the proposed new line of research. The latter must be duly justified.

The Monitoring Procedure concerns the periodic assessment of the Coursework and Research carried out by the PhD student. Assessment is based on the outcome of **annual** meetings during which the PhD student illustrates the activities carried out to the Supervisory Board. A positive assessment made by the Board at the end of the year is a necessary condition for the student to be admitted to the following year.

During the annual assessment, the student will be awarded credits for research (usually in the second and third year), thesis writing activities (in the third year) and independent learning activities. The relative examinations will be carried out and recorded according to one of the methods provided for by the ESSE3 Information System (see Article 7). Verification of the credits for independent learning activities will take into account seminar attendance certificates and evidence of other independent learning activities performed by the student with the Supervisor's oversight.

The Monitoring Procedure concerns the writing of the Doctoral Thesis and admission to the final examination to defend it in order to gain the qualification of PhD in "**Risk and Sustainability in Civil, Architectural and Environmental Engineering Systems**". In this regard:

- at the end of the third year of the PhD course, each student must sit a "Candidacy Examination" to assess his/her actual readiness for the conclusion of the PhD course: if he or she does not pass this examination, the PhD course must be extended beyond the third year, without the benefit of any scholarship;
- **upon admission to the final examination, the Board will give a favourable assessment if the PhD candidate's research includes at least one research work falling into one of the following categories:**
 - o **in WoS/Scopus indexed journals and/or monographs with an ISBN (bibliometric areas), with special awards for articles published in international scientific journals belonging to the Q1 quartile of the Scimago Journal Ranking (<https://www.scimagojr.com/index.php>).**

- **in journals of the WoS/Scopus range and/or monographs with an ISBN (non-bibliometric areas).**

The qualification of Doctor of Philosophy, abbreviated as “PhD.,” is awarded following the positive assessment of a research thesis that contributes to the advancement of knowledge or methodologies in the chosen field of investigation.

The PhD thesis must be

- a) written in Italian, English or in another language duly authorised by the Supervisory Board;
- b) provided with a summary in Italian and English;
- c) accompanied by a report drawn up by the PhD student to illustrate the activities carried out during the PhD course and any works published.

The Thesis is subjected to a preliminary assessment by at least two highly qualified members of teaching staff from outside the University of Salerno, including those pertaining to foreign academic institutions in accordance with the University regulations (Article 16, paragraphs 3 and 4).

The public defence of the thesis takes place before an examining board composed in accordance with the University regulations (Article 17).

The assessment of the Final Examination and Public Defence of the Thesis is expressed as Insufficient / Sufficient / Fair / Good / Excellent), according to the procedures provided for by the ESSE3 Information System.

Article 11 European Doctorate Recognition

The PhD student, in agreement with his/her Supervisor, can apply for recognition of the qualification as a European Doctorate, in addition to the title of PhD.

The “Doctor Europaeus” certification, accredited by the European University Association, is issued by the University when the following conditions are met:

- the doctoral thesis receives a favourable verdict from at least two referees, appointed by the Board and pertaining to university institutions in two European countries different from the one where the thesis is defended (the referees’ reports must also be attached to the final exam report);
- at least one member of the examining board comes from a university in European country different from the one where the thesis is defended;
- part of the thesis must be defended in a European language other than that of the country where the thesis is defended;
- the thesis must be the result of a period of work and research, lasting at least 3 months, carried out in another European country.

Co-supervised thesis programmes are regulated by the University's regulations (Articles 18 and 19).

Article 12 Relations with the University and External Bodies

The present Regulations describe the reciprocal relations and commitments between PhD students, Supervisors and the PhD Oversight Board. Therefore, any amendment to the Regulations shall be valid only for PhD courses beginning after the approval of such an amendment.

Pursuant to Article 5, the Supervisor must follow the PhD student entrusted to him/her for the entire duration of the PhD course; the grant accompanying the PhD course limits the possibility for PhD students to participate in cultural activities outside the University.

Each Supervisor will have the right to submit a report to the Board before being assigned to the PhD students, illustrating the activities of current and/or prospective research projects and/or agreements that will enable the identification of additional financial resources to support the PhD student's course.

As the PhD course has no financial expenditure facilities, the agreements, research contracts and any other relationship with External Bodies will be managed by the Department. The PhD course will be represented in relations with the Department by a member of the Board appointed to this office for a duration of three years.

Article 13 Transitory Regulations

The first implementation of the present Regulations will come into force in the 35th PhD Cycle (Academic Year 2019/2020).

The Coordinator of the Board is delegated to take the necessary actions to ensure that these Regulations are approved and recognised by National and EU Institutions, and to promote initiatives aiming to establish relations and agreements with External Bodies in the public and private sectors.