Statutes of the
Doctoral Programme in Civil Engineering Sciences

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Art. 1. Preamble

Aim and Focus:

The Doctoral Programme Civil Engineering Sciences (DPCIVE) aims to provide research training in civil engineering and related scientific areas (such as the UL research priorities Computational Sciences and Material Sciences) at an internationally competitive level following a multi-disciplinary scientific approach to the ever-increasing complexity of modern engineering. The Doctoral Programme considers training through application-aware research as its essential mission. It thus prepares doctoral candidates for careers in both the academic and private sectors.

Scientific Objectives

- To provide disciplinary research training in civil engineering at international level;
- To create an innovative and inspiring atmosphere for research in the area of constructional and infrastructural civil engineering as well as related domains;
- To perform internationally competitive engineering research;
- To integrate doctoral candidates into scientific and professional networks;
- To prepare doctoral candidates for careers in academia and/or industry;
- To provide doctoral candidates with interdisciplinary knowledge and skills.

Art. 2. Research Theme

The overarching research theme of the multi-disciplinary Doctoral Programme in Civil Engineering Sciences aims at the identification and solution of scientific challenges related to the future built environment. A central aspect is in developing new and improved scientific and technological approaches, methods and procedures for sustainable, resource-efficient and lifecycle-aware planning, construction, operation and re-use/re-cycling of next-generation buildings (high-rise office buildings, public buildings, passive houses, etc.), engineering structures (bridges, tunnels, etc.) and infrastructural networks (energy, water, communication, traffic). The research results will contribute original insights to the scientific body of work by a holistic integration of the key-domains: adequate materials and structures, the most suitable ways for energy production, consumption and storage as well as the most eligible models and data for integrated analysis and planning. For this reason, the Doctoral Programme will bring together scientific expertise from various engineering disciplines in a common research environment. Doctoral candidates shall receive the opportunity for systemically integrated inter-disciplinary research, based on highly specialised fields of individual research. Cooperation with internationally highly reputed scientists and companies will guarantee both, cut of edge research results as well as transfer of relevant knowledge to industry. By this, the Doctoral Programme will stimulate the national research capacity through interdisciplinary, inter-sectorial and international partnerships.

Within the three main research axes

- Structure and Building Materials,

- Building Information Models (BIM), and

- Energy Consumption, Storage and Production,

research activities are simultaneously taking into account common requirements for construction, applying harmonised methods and covering the most relevant life- cycle phases of structures: the initial design and manufacturing, the construction, the in-use phase, the interaction with its natural and built environment and the final deconstruction and re-use as well as possible changes of use or conversion needs during the use time have to be considered.

The Doctoral Programme aims at making a contribution to solving environmental challenges of the building sector responsible for a large amount of CO2 emissions and resources consumption. Reducing this impact remains a huge challenge for the construction industry. Therefore, major environmental challenges – based on the notions of sustainability and life-cycle thinking in the construction sector – are reflected in the ultimate environmental goals of the research programme respecting the "three Rs & zeros":

- Reduction of energy consumption towards zero,
- Reduction of consumption of natural resources towards zero,
- Reduction of CO2 production towards zero.

The research of the Doctoral Programme also wants to provide consulting scientific expertise and necessary fundamental data to support societal opinion-building and political decision-making with respect to the progress of regulations, as expressed on the EU level e.g. by the "Construction Products Regulations (CPR)" or the directive on the energy performance of buildings 2010/31/EU. On the national level, the research theme focuses on eco-construction/sustainable construction and the circular economy, two of the main niches of the governmental plan of 2014-2018 and therefore integrates into the strategy of university and the Luxembourg Ministry of Economy.

Art. 3. Structure

The DPCIVE is part of the Doctoral School in Science and Engineering (DSSE). It is composed in accordance with the DSSE main statutes. The members of the Programme Committee, the Doctoral Candidate Representatives as well as the supervising members are announced online on the programme related websites of the DSSE.

Doctoral candidate representatives

Three doctoral candidates, preferably with different background (Structure and Building Materials/ Energy Consumption, Storage and Production/Building Information Models) represent the doctoral candidates in the DP-CIVE. They are elected for two years (renewable) by the doctoral candidates that are enrolled in the programme. The representatives can participate in the Programme Committee meetings with a consultative role.

Art. 4. Research and Training Environment

The Doctoral candidates (DCs) are embedded in a multinational and open-minded research and training environment. The DCs are hosted by the Institute of Civil and Environmental Engineering (INCEEN) at the Research Unit in Engineering Sciences (RUES), which is composed of professors and researchers of various engineering disciplines, creating a vivid resource of complementary

Valorisation of Academic Research

The Doctoral Programme serves as framework for joining competences around future civil engineering. The DP aims at systematically involving external academic and scientific advisors from industry and public administration. As scientific and professional exchange is seen as crucial in order to tackle the research objectives of this doctoral training unit, research collaborations are materialised in study visits/dedicated industrial training and the participation of co-operating professors/advisors in the supervision team.

Equipment

The research environment of the DCs offers all necessary equipment allowing independent experimental studies which will then be scaled up by adequate research methodology using appropriate (and existing) software tools.

The DCs have the privilege of being installed in the *Halle des Essais* in Belval, a state of the art laboratory equipped modern research area with e.g. a large testing span for stress tests with hydraulic presses (10kN to 1MN), force and deformation measurement equipment, a concrete lab, climate chambers etc. In addition, the DC can have privileged access to specialised equipment via partner institutions (industry and academia).

Dedicated computation resources are available for numerical analysis of data and simulation tasks via a shared memory compute server with 120 CPU cores and 3TB of RAM to that members of RUES can have priority access. The computing capabilities are embedded in the university's HPC infrastructure and allows analysis of huge amounts of data (as they appear with complex BIM models) and also high-resolution simulations in engineering (ageing and damage of building materials, thermo-mechanics/fluid dynamics, full scale structural analysis, process engineering). For even larger requirements in computational power and storage requirements, the HPC facilities of the university are available to the DCs. Licenses for standard commercial software are made available by RUES or the supervisor's laboratory.

Art. 5. Doctoral Training

Objectives

The overall objective of the training program is to enable excellent graduate candidates from Civil Engineering and other related disciplines to acquire both academic and personal skills including

- Intellectual, academic and technical skills
- Relational skills
- Self management skills
- Leadership and management.

Principles

The Doctoral Programme is guided by the following principles:

- Conversely to other engineering teaching programs, an engineering Doctoral training programme is research-oriented. Doctoral candidates undertake, as their core training, a research study guided by a supervisor and an advisory committee.
- Formal and informal teaching via seminars, workshops and other course components complement the scientific work on the individual research project. Doctoral candidates should participate in activities such as seminars, poster presentations, courses and summer schools.
- Balance and flexibility is guaranteed via a set of elective courses that the candidate can tailor to his/her research and personal needs.

Learning Outcomes

- research ability and capacity to manage and present information
- ability to conduct interdisciplinary research and use of different research methods.
- achievement of a common ground of knowledge through a common track of taught courses
- ability to teach and to communicate with target groups, as part of the skill set required for the personal career development
- independent thinking and ability to apply the own experience, expertise and knowledge to solve problems.

Activities

The Doctoral Programme requires all Doctoral candidates to actively participate in knowledge, skills and competence-building training, which is seen as complementary to the individual supervision and mentoring provided by the supervisor and his/her research team.

The doctoral candidates are required to obtain a minimum of 20 ECTS credit points of training modules. Candidates who are not able to acquire the 20 required credit points can be awarded a doctorate but will not obtain a diploma supplement.

The acquired credit points will be distributed on the following training categories:

- Category 1 - Scientific competences, thematic training related to research: at least 10 ECTS
- Category 2 - Inter/cross-disciplinary competences, common academic and scientific modules: at least 3 ECTS (including a compulsory course on good scientific practice or ethics, such as the one organised at University level)
- Category 3 - Transferable skills training and development: at least 3 ECTS

ECTS in Category 2 and 3 must sum to at least 10 ECTS.

Disciplinary training activities which can be attributed with ECTS from Category 1 and 2 (depending on the research topic):

- Participation in thematic seminars.
- Participation in advanced doctoral courses and seminars to complement scientific knowledge at UL.
- Regular and active participation in and contribution to a “Journal Club”.
- Participation in complementary courses from associated Engineering Master programmes or from other suitable curricula at UL.
- Participation in summer- or winter-school-type courses organised by UL.

Disciplinary training activities which can be attributed with ECTS from Category 1 and 2 (depending on the research topic) only if the programme committee has approved:

- Participation in summer- or winter-school-type courses organised by other universities or scientific institutions.
- Participation in courses from Master programmes or from other suitable curricula at external universities and institutions.
- Publication of research results in international journals or the proceedings of conferences (at least Q2 tier).
- Teaching activities in graduate and postgraduate programmes at UL in the context of T&L quality measures (subject to dedicated training and reporting).

Disciplinary training activities which cannot be attributed with ECTS:

- Regular reporting to the CET (Doctoral Advisory Committee) as part of the usual duties of the doctoral candidate.

Typical *transferable skills* training activities which can be attributed with ECTS from Category 3:

All courses that target at skills and competences that exceed the thematic topic of the doctorate and science in general and which are applicable in a wider professional context (non-exhaustive list):

Courses in

- self-management: planning and organisation independent working;
- writing a scientific publication or a grant application;
- presentation of scientific results (e.g. “Giving a scientific talk”);
- entrepreneurship workshops, visits of companies;
- career development (presentation of a CV, preparation of a job application interview etc.);
- language courses.

Mobility

Doctoral candidates are strongly encouraged to participate in courses, summer schools, scientific missions and internships, etc. offered by foreign institutions or by companies. The Doctoral Programme will support these activities logistically and, if possible, financially.

Art. 6. Admission Requirements

Doctoral school candidates must have successfully completed university studies in Engineering Sciences (MSc or equivalent). Candidates with a background in physics or mathematics are also being accepted, based on their motivation and potential for interdisciplinary research.

Applicants are required to render evidence of above-average results obtained at university. The applicant’s past career must reveal his/her particular qualification for and dedication to scientific work.

Admission will only be considered when funding of the salary/fellowship is guaranteed. Members of the Doctoral Programme commit to present exclusively candidates who full-fill these criteria.

According to the regulations at the University of Luxembourg, the admission to the Doctoral School is subject to the admission as a doctoral candidate by the President of the University of Luxembourg