

Study and Examination Regulations for the International Postgraduate Master's Degree Program "Building Sustainability – Management Methods for Energy Efficiency" on the TU-Campus EUREF of the Technical University of Berlin

Studien- und Prüfungsordnung für den weiterbildenden, internationalen Masterstudiengang „Building Sustainability – Management Methods for Energy Efficiency“ am TU-Campus EUREF der Technischen Universität Berlin vom 30.10.2015

- unofficial translation -

On October 30th, 2015 by the authority given by §18 para. 1 No. 1 of the Constitution of the Technical University of Berlin as well as § 71 para. 1 No. 1 of Berlin's Higher Education Act dated 26. July 2011 the Joint Commission with Decision-Making Authority TU-Campus EUREF of the Technical University Berlin enacted the following Study and Examination Regulations for the international postgraduate master's program "Building Sustainability – Management Methods for Energy Efficiency":

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I. General Section

§ 1 - Scope of Application

These study and examination regulations govern the goals and structure of the degree program as well as the requirements and examination procedures in the postgraduate master's program "Building Sustainability - Management Methods for Energy Efficiency". It supplements the regulations governing the general study and examination methods of the Technical University of Berlin by providing course-specific provisions.

§ 2 - Commencement and Expiration

- (1) These regulations come into effect in the winter semester 2016/2017.
- (2) The study and examination regulations for the postgraduate master's program "Efficient Construction and Operation of Buildings" („Energieeffizientes Bauen und Betreiben von Gebäuden“) dated 09 June 2011 (Official Gazette no. TU 07/2012, S. 200 and 204) expire four semesters after the following study and examination regulations take effect. Students who have not yet completed their studies by that time pursuant to clause 1, are automatically transferred to the study and examination regulations for the program "Building Sustainability – Management Methods for Energy Efficiency". The examination board

shall make decisions regarding the transfer of credits of completed course work.

II. Program Goals and Structures

§ 3 - Qualification Objectives, Content and Professional Fields

- (1) The goal of this program is to provide a common theoretical and practical knowledge in the field of energy-efficient sustainable building management in the context of urban areas, while considering the varying prior knowledge of the students. In light of current changes in climate and economics, the postgraduate master's program "Building Sustainability - Management Methods for Energy Efficiency" deals with the challenges and opportunities of the integration of renewable energies into buildings and urban quarters while taking other aspects of sustainability, such as economic and social into account.

"City and Energy" represent the core of this master's program, which is the understanding of economic processes that put technical indicators and innovation into the forefront of the building sector. Thus graduates will be able to determine key indicators of energy efficient building assessment, to define standards of project and quality management and carry out feasibility studies as part of financing and investment calculations. They can assess and explain the circumstances under which the key figures or concepts are applied. They can also represent European and international standards in the field of building certification and apply them to building projects.

Technological innovations in this area reflect a major challenge, which will be considered in cooperation with non-university partners in terms of responsibility in various social contexts. Using this cooperation, solution strategies are to be developed for the problems of civil society. With this knowledge graduates will be able to outline the different social roles of energy efficiency and draw comparisons. They can also analyze cases of good and bad examples in project management.

Hereby, the learning process of the students is the focus. The program thus serves on deepening central ideas of engineering science including technical and economic aspects of energy efficient construction. Also, fundamental concepts of coordination and working with various stakeholders will be presented. As a result, graduates are able to apply these basic concepts into building projects involving all interested parties.

Finally, skills in coordination, presentation and ultimately the responsible design as well as administration of appropriate comprehensive management will be conveyed. As a result, graduates are able to independently plan and design building projects by combining multiple disciplines as well as possible difficulties to reconcile interests.

Using different teaching methods essential skills will be taught connecting both the practical and the academic. This allows graduates to calculate fundamental building, as well as project related, key indicators and make informed arguments on how real projects are to be organized and developed.

The master's program will be conducted in English, so that it is internationally attractive. The classroom sessions will be held on campus located near the *Schöneberg* Gasometer. Here, students can experience and influence the synergy of knowledge and technology between the Technical University of Berlin and local technology businesses. In doing so social and technical skills can be actively combined and thus have the opportunity, not only, to evolve personally but also affect the future of society.

- (2) Today, responsible companies must adjust to sustainability-oriented solutions. The associated high additional need for well trained professionals with specialized knowledge of English is not yet covered by existing training opportunities. The TU-Master's program closes the existing gap in this area of education and prepares students for technical management positions in relevant companies in the construction and real estate markets.
- (3) The interdisciplinary orientation and the skills acquired during courses allow graduates of this master's

program to work in the real estate and energy sectors, and the consumer and environmental protection associations, including preparing them for upper management positions. These range from environmental protection managers, to energy (contract) decision-making and implementation process leaders, to members of central management departments, and to energy supply project managers in the building sector.

§ 4 - Course Commencement, Period of Study and Degree Requirements

- (1) The program begins in the winter semester.
- (2) The standard period of study including the master's thesis comprises three semesters.
- (3) The scope of the master's program is 90 credit points.
- (4) The curriculum as well as the entire examination process is designed and organized so that the program can be completed within the standard period of study.

§ 5 - Degree Program Structure

- (1) The postgraduate master's program is divided into consecutive required and elective modules. The recommended sequence of the modules is presented in the example program schedule located in the appendix. Module pre-requisites must be adhered to; these can be found in the module descriptions.
- (2) A total of 90 credit points must be completed; the modules comprise 72 credits and the master's thesis 18 credits. Eight required modules totaling 60 credits and two elective modules totaling 12 credits must be completed. Through field trips during the first two semesters and the selection of educators the necessary practical experience is ensured.

A description of the modules and their designation can be found in the module list in appendix 1.

III. Examination Processes and Requirements

§ 6 - Purpose of the Master's Examination

The master's examination will determine whether a candidate has achieved the qualification objectives in accordance with § 3 of these regulations.

§ 7 - Academic Degree

Upon passing the master's examination, the Technical University of Berlin empowered by the Joint Commission with Decision-Making Authority will bestow the degree "Master of Business Administration" (MBA).

§ 8 - Scope of the Master's Examination and Calculation of the Final Grade

- (1) The master examination consists of the examinations of the modules listed in the module list in appendix 1 as well as the master's thesis according to § 9.
- (2) The final grade is calculated according to the principles in § 47 of the General Study and Examination Regulations (*AllgStuPO*). This includes the examination grade of all graded modules marked for inclusion in the final grade plus the grade of the master's thesis.

§ 9 - Master's Thesis

- (1) The master thesis is generally to be prepared in the 3rd semester. It accounts for 18 credits, should have a length of approximately 50 pages, and be completed no later than four months after topic approval. If there is an important reason, the chairman of the examination committee, may grant an extension of up to one month, and up to three months in cases of severe illness. The examination committee has purview over all regulation exceptions.
- (2) In order to apply for admission to master's thesis, proof of successful completion of the module

examinations totaling at least 60 credits must be submitted.

- (3) The thesis topic may be changed once, however only within the first four weeks after topic approval.
- (4) The master's thesis is to be written in English.
- (5) The procedure of applying, admission to, and the assessment of theses are regulated in the applicable version of the General Study and Examination Regulations (*AllgStuPO*).
- (6) Persons with both the professional and educational experience may be appointed as first or second examiners for theses. At least one of the examiners must be associated with the TU.

§ 10 - Types of Examination and Examination Registration

Examination forms and the registration procedure of module examinations is governed by the applicable version of the General Study and Examination Regulations (*AllgStuPO*). In addition, the following exam form is offered: term paper.

§ 10 a - Examination Type "Term Paper"

The term paper is a written work where students are to demonstrate their understanding of a specific question or questions from the module topic and be able to apply academic research skills in the context of the module. The examiner will determine possible topics, procedures, the timeframe, approved tools, composition, evaluation criteria, and make them known at the beginning of the module. The term paper will be evaluated based on the grading scale set forth in the General Study and Examination Regulations (*AllgStuPO*).

IV. Appendix

- Appendix 1: Module List
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Appendix 1: Module List

Module	ECTS	Examination Type	Graded	Weighting in the Final Grade
Required Module				
Project Management	9	Portfolio	yes	1
Energy Performance of Buildings	9	Written (Exam)	yes	1
Lecture Series: Building and urban area structures – Modifications for sustainability and energy management	6	-	no	0
Introduction Project	6	Portfolio	yes	0
Interdisciplinary Project	12	Portfolio	yes	1
Energy-Efficient Societies	6	Portfolio	yes	1
Real Estate Economics	6	Portfolio	yes	1
Lifecycle Management	6	Portfolio	yes	1
Electives				
Integration of Renewable Energies	6	Portfolio	yes	1
Smart Buildings	6	Portfolio	yes	1
Innovation and Technology Management, Part 1 & 2	12	Portfolio	yes	1
Master's Thesis				
Master's Thesis (individual topics)	18	Final Paper	yes	1
Σ	90			

Appendix 2: Example Program Schedule

Example Program Schedule
Building Sustainability – Management Methods for Energy Efficiency

1. Semester / Winter Semester	2. Semester / Summer Semester	3. Semester / Winter Semester
Project Management 9 ECTS	Real Estate Economics 6 ECTS	Lifecycle Management 6 ECTS
Energy Performance of Buildings 9 ECTS	Compulsory electives: - Technical: Integration of Renewable Energies – 6 ECTS, Smart Buildings – 6 ECTS - Management: Innovation and technology management – 12 ECTS	
Introduction Project 6 ECTS	Interdisciplinary Project 12 ECTS	Master's Thesis 18 ECTS
Lecture Series: Building and urban area structures: Modifications for sustainability and energy management 6 ECTS	Energy-Efficient societies 6 ECTS	
30 ECTS	30 ECTS	30 ECTS

Appendix 3: Module Descriptions

Required Modules

Module Name	Project Management
Credit Points (ECTS)	9
Qualification Objectives and Skills	<p>This course is intended to provide students with the understanding and practical skills required to utilize internationally recognized methodology and tools of project management through all stages of life cycle.</p> <p>The students understand the difference between document based and product model based information management in construction projects and learn new ways to utilize product modelling technologies for design, quantity surveying, and cost estimating as well as for feasibility analysis, energy simulations and visualizations of three dimensional spaces. They also learn to improve the product data management for a building's entire life cycle used in many ways to support the use and maintenance of buildings.</p>
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites

Module Name	Energy Performance of Buildings
Credit Points	9
Qualification Objectives and Skills	<p>Students will gain knowledge of the energy performance of buildings. Based on basic knowledge of energy production, distribution, storage and the use of energy, simple methods will be learned and applied using practical examples.</p> <p>The aim is that students are able to optimize energy consumption of new and existing buildings in the interplay between the building envelope and building technologies.</p>
Examination Type	Written Exam
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites

Module Name	Lecture Series: Building and urban area structures – Modifications for sustainability and energy management
Credit Points	6
Qualification Objectives and Skills	<p>Students will be able to follow experts' lectures about technological, social, and ecological dimensions regarding challenges in planning and construction processes with a special focus on the economy of energy. The lectures take both building and area levels into account. Students</p>

	will be able to identify central facts.
Examination Type	--
Graded	No
Module Examination: Prerequisites and Requirements	Not Applicable

Module Name	Introduction Project
Credit Points	6
Qualification Objectives and Skills	Students may consider a small project from the perspectives: Energy and Economics and with assistance write a decision paper.
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites 50 points each will be awarded for a written thesis and an oral presentation.

Module Name	Interdisciplinary Project
Credit Points	12
Qualification Objectives and Skills	Students may consider a complex project from the perspectives: Energy and Economics without assistance and write a decision paper.
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites 50 points each will be awarded for a written thesis and an oral presentation.

Module Name	Energy-Efficient Societies
Credit Points	6
Qualification Objectives and Skills	<p>Participants of this module will</p> <ul style="list-style-type: none"> • learn different ways of conceiving energy efficiency in a global context • learn societal consequences of energy efficiency • learn the different roles and job profiles for students of this program • analyze good and bad practices of project management, including their own project work • Acquire skills for dealing with complex and diverse audiences (i.e. peer experts, contractors, users in different project contexts); • Acquire skills for conflict management (communication, participation and cooperation) <p>Competences gained: Professional 30 %, Methods 30 %, Systems 15 %, Social 25 %</p>

Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites 50 points each will be awarded for a group presentation and an individual term paper.

Module Name	Real Estate Economics
Credit Points	6
Qualification Objectives and Skills	The didactic goal is the understanding and implementation of the essential concepts of real estate financing and investment relevant to business problems and management decisions. The students know the basics of financial mathematics and they are able to calculate simple real estate development projects as a part of feasibility studies.
Examination Type	Written Exam
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites

Module Name	Lifecycle Management (Facility Management)
Credit Points	6
Qualification Objectives and Skills	Real Estate and Facility Management are significant in the global structural change from an industrial towards a service-orientated society. In this course, students learn relevant working methods and their theoretical basis (e.g. life cycle concepts, life cycle information management, service and facility management standards) together with an understanding of services and customer needs. Students are able to apply those management concepts and make decisions in terms of implementing an FM organization and its business processes according to the needs of building owners and users.
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	No Prerequisites 51 points will be awarded for a written exam, 49 points for a written paper.

Elective modules

Module Name	Integration of Renewable Energies
Credit Points	6
Qualification Objectives and Skills	This module will provide insight into various ways to supply energy - heat, cold, and electricity - to buildings as well as districts based on renewable sources. The planning, implementation and operation of these technologies in such an environment with special emphasis on energy

	<p>management is presented. Currently available solutions as well as current development and future expectations for so-called smart buildings will be regarded.</p> <p>Students will gain a basic understanding of the applicability and limitation of renewable energy sources in a building environment.</p> <p>In this respect, students will develop academic research skills in the area of the design of building- and district-related energy-supply systems based on renewable energy sources and their interplay with conventional/fossil sources.</p>
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	<p>No Prerequisites</p> <p>30 points will be awarded for a written paper, 20 points for a presentation and 50 points for an oral exam.</p>

Module Name	Smart Buildings
Credit Points	6
Qualification Objectives and Skills	<p>This module will provide insight into the planning, implementation and operation of technologies (software, communication and hardware) in building monitoring, control and automation, with special emphasis on energy management. Currently available solutions will be regarded as well as current development and future expectations for so-called smart buildings.</p> <p>Students will gain a basic understanding of the flexible and intelligent energy management of modern home environments. In view of a holistic energy balance, students develop detailed knowledge of the internal factors such as building configuration, users/usage, monitoring, control/automation and distributed generation. On the other hand, they will understand from a smart building perspective the relation towards external factors such as energy procurement, (regenerative) energy supply, legal and market framework for construction and operation.</p> <p>Graduates will have the ability to determine and evaluate the effects of smart building design and implementation alternatives with respect to energy efficiency and compare them to other measures (e.g. intelligent automation of heating compared to modifications of building envelope).</p> <p>In this respect, students will develop academic research skills in the area of telecommunications in smart homes and gain hands-on experience in realization and management of energy-efficient systems in the networked building.</p>
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	<p>No Prerequisites</p> <p>30 points will be awarded for a written paper, 20 points for a presentation, 25 points for oral feedback and 25 points for project work (result, documentation and feedback).</p>

Module Name	Innovation and Technology Management
Credit Points	12
Qualification Objectives and Skills	<ul style="list-style-type: none"> • Understanding the central terms and basics of innovation and technology management • Understanding the correlation between innovation and technology management • Raising awareness and motivation for applied innovation research • Transfer of knowledge and innovation management methods • Insights into concrete innovation projects in practice • Application of creativity and presentation techniques for the successful development and presentation of innovation projects • Strengthening the capacity of interdisciplinary teamwork • Systematic preparation for the implementation of innovation projects to the development of a first prototype
Examination Type	Portfolio
Graded	Yes
Module Examination: Prerequisites and Requirements	<p>No Prerequisites</p> <p>60 points will be awarded for an oral presentation of a prototype or business plan and 40 points for a written project report.</p>

The graded modules, without special weighting, together with the final grade of the master's thesis make up the final grade.