

I. Legal and Administrative Provisions

Joint Committees

Study and examination regulations for the international continuing education master's program in Building Sustainability – Management Methods for Energy Efficiency at TU-Campus EUREF of the Technische Universität Berlin

October 30, 2015

On October 30, 2016, the TU-Campus EUREF Joint Decision-Making Committee of the Technische Universität Berlin adopted the following study and examination regulations for the international continuing education master's program in Building Sustainability – Management Methods for Energy Efficiency in accordance with section 18, paragraph 1, item 1 of the *Grundordnung der Technischen Universität Berlin* (TU Berlin University Charter), and with section 71, paragraph 1, item 1 of the *Gesetz über die Hochschulen im Land Berlin* (act governing higher education institutions in the state of Berlin - BerlHG) in the version of July 26, 2011 (Berlin law gazette - GVBl., p. 378).^{*1}

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I. General regulations

1 – Scope of application

These study and examination regulations set out the aims, structure, and requirements and arrangements of examinations in the continuing education master's program in Building Sustainability – Management Methods for Energy Efficiency. They supplement the *Ordnung zur Regelung des allgemeinen Studien- und Prüfungsverfahrens der Technischen Universität Berlin* (the University's regulations governing general study and examination procedures - AllgStuPo) with program-specific provisions.

2 – Entry into force

- (1) These regulations enter into force in the 2016/2017 winter semester.
- (2) The study and examination regulations for the continuing education master's program in *Energieeffizientes Bauen und Betreiben von Gebäuden* (energy-efficient construction and building management) of June 9, 2011 (TU official gazette 07/2012 pp. 200 and 204) will no longer apply four semesters after the present study and examination regulations take effect. Students who by this time have not yet completed their degree in

^{*}) Approved by the TU Berlin Executive Board on January 20, 2016.

accordance with the regulations mentioned in the previous sentence will automatically be transferred to the present regulations. The Examination Board decides on how work completed before that date is to be credited.

II. Program aims and structure

3. Program aims, content and areas of professional activity

(1) The aim of the program is to provide the students with a common theoretical and practical knowledge base in energy-efficient sustainable facility management in urban areas, taking into account their differing knowledge bases on entering the program. In the context of climate change and economic transformations, the continuing education master's program in Building Sustainability – Management Methods for Energy Efficiency is concerned with the challenges and opportunities of integrating renewable energies in buildings and urban neighborhoods while taking into account further sustainability issues (e.g. economic and social).

At the heart of this master's program is a comprehensive approach to the topic of energy in urban areas that focuses on understanding economic processes and the use of technical indicators and innovations in the building sector. This means that graduates of the program will be able to determine indicators for the energy performance of buildings, set project and quality management standards and carry out financial and investment calculations as part of feasibility studies. They will be able to evaluate and justify which indicators and concepts should be used under which circumstances. They will also be able to present European and international building certification standards and apply these to building projects.

Technological innovations in this area are a central challenge, and they are examined in cooperation with partners outside the University from the point of view of responsibility in a variety of societal contexts. The aim of this work with external institutions is to develop solutions for problems faced by civil society. With this knowledge, the graduates will be able to outline and compare the various societal roles of energy efficiency. They will also be able to analyze examples of good and bad practice in project management.

The focus here is on the students' learning process. Therefore, by developing students' understanding of the key engineering and technical aspects of energy-related building projects, the program also provides them with a knowledge base in the disciplines of the stakeholders in consultation processes. This means that the graduates will be able to explain the core concepts of these disciplines and take decisions in building projects while involving all interested parties.

Lastly, students develop skills in coordinating, facilitating and responsibly designing and leading appropriate and inclusive consultations. The graduates will therefore be able to independently plan and design building projects, and to bring together the participating disciplines and their interests, even where these are difficult to reconcile.

A variety of teaching methods provide students with the core skills and establish a link to practice and research. Graduates will therefore be able to calculate key building and project indicators and use these to argue how real projects should be organized and developed.

The master's program is taught in English in order to make it attractive internationally. Lectures and seminars take place on the campus around the Schöneberger Gasometer. On campus, students can experience and help shape knowledge and technology transfer between the Technische Universität Berlin and companies operating in this field. They can acquire social and subject-specific skills and put these to active use, giving them the opportunity not only to develop themselves but also shape the future of society.

(2) Today, responsible companies must adapt to solutions that are based on sustainability criteria. The resulting significant increase in demand for expert personnel with wide-ranging training and specialist English skills is not currently being met by existing courses. The TU master's degree closes the gap in the education and training being provided in this field and prepares students for technical leadership positions in relevant companies in the building and real estate industry.

(3) Based on the knowledge acquired in this transdisciplinary master's degree, graduates will be able to find employment in the real estate and energy industries, in consumer and environmental protection organizations and on management boards. This includes work in planning, decision-making and implementation processes, as energy contract and environmental protection managers, as members of central management departments, and as project managers in the building energy sector.

4 - Program start date, standard duration, and number of credits

(1) The program starts in the winter semester.

- (2) The standard duration is three semesters including completion of the master's thesis.
- (3) The program is worth 90 credits.
- (4) The teaching curriculum and all examination procedures are structured so that students can complete the program within the standard duration.

5 - Program structure

- (1) The continuing education master's degree is made up of a combination of compulsory and elective modules that are designed to complement and build on each other. The recommended module pathway is shown in the sample program schedule in Annex II. However, content-related entry requirements for modules shown in the schedule apply.
- (2) Students earn a total of 90 credits, of which 72 are awarded for taught modules and 18 for the master's thesis. They must take eight compulsory modules worth a total of 60 credits and two compulsory elective modules worth a total of 12 credits. An important link to practical work in the field is provided by excursions in both semesters and through the mix of teaching staff selected.

The modules assigned to the different fields can be found in the module list (Annex 1).

III. Requirements and conduct of examinations

6 - Aim of the master's examination

The master's examination determines whether a candidate has achieved the program aims in accordance with section 3 of these regulations.

7 - Master's qualification

Students who have passed the master's examination are awarded the academic title master of business administration (MBA) by the Technische Universität Berlin through the Joint Decision-Making Committee (GkME).

8 - Contents of the master's examination; calculation of the overall grade

- (1) The master's examination comprises the module examinations listed in the module list (Annex 1) and the master's thesis as explained in section 9.
- (2) The overall grade is determined in accordance with the principles outlined in section 47 of AllgStuPO. It is based on a) the module examinations that are graded and form part of the overall grade according to the module list, and b) the grade of the master's thesis.

9 - Master's thesis

- (1) The master's thesis is usually completed in the third semester. It is worth a total of 18 credits (approx. 50 pages) and amounts to a maximum of four months' work. If there is an important reason, the chair of the Examination Board can grant an extension of up to one month, and in cases of illness up to three months. The Examination Board decides on other arrangements regarding exceptions.
- (2) To be admitted to complete a master's thesis, students must submit evidence of having successfully completed module examinations worth at least 60 credits to the responsible office.
- (3) The topic of the master's thesis may be rejected once, but only within the first four weeks after it has been issued.
- (4) The master's thesis must be written in English.
- (5) The procedure for applying for admission to work on final dissertations and the procedure for evaluating them are set down in AllgStuPO as amended.
- (6) Persons with experience of professional practice and training can be appointed as first or second examiners of final dissertations. One of the two examiners is affiliated to TU.

10 - Types of examination and examination registration

Types of examination and the procedure for registering for module examinations are set down in AllgStuPO as amended. In addition, the following types of examination are offered: Term paper.

10a – Term paper

The term paper is a written assignment through which students are expected to demonstrate their ability to produce a piece of academic work on a specific aspect of the module subject and place it in the context of the module. The examiner decides on possible questions, the precise length of the paper, the time to be spent on it, the resources permitted, the rules for presenting it and the assessment criteria. He or she announces these at the beginning of the module. Grades are awarded according to the grading scale in AllgStuPO.

IV. Annexes

Annex 1: Module list

Annex 2: Sample program schedule

Annex 3: Module descriptions

Annex 1: Module list

Module	Credits	Type of examination	Graded	Weighting in overall grade
Compulsory modules				
Project management	9	Portfolio	Yes	1
Energy performance of buildings	9	Written (examination)	Yes	1
Lecture series: building and district 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
Life cycle management	6	Portfolio	Yes	1
Compulsory elective modules				
Integration of renewable energies	6	Portfolio	Yes	1
Smart buildings	6	Portfolio	Yes	1
Innovation and Technology Management	12	Portfolio	Yes	1
Master's thesis				
Master's thesis (individual topic)	18	Final dissertation	Yes	1
Total	90			

Annex 2: Sample program schedule

Sample program schedule

Building Sustainability – Management Methods for Energy Efficiency

1st Semester / WS	2nd Semester / SS	3rd Semester / WS
Project management 9 credits	Real estate economics 6 credits	Life cycle management 6 credits
Introduction project 6 credits	Compulsory elective modules - Technical, 2x6 credits: Integration of renewable energies; smart buildings - Management, 12 credits: Innovation and technology management	
Lecture series: building and district structures – modifications for sustainability and energy management 6 credits	Project 12 credits	Thesis 18 credits
Energy performance of buildings 9 credits	Energy-efficient societies 6 credits	
30 credits	30 credits	30 credits

Compulsory modules

Module name	Project management
Credits	9
Module aims and skills	<p>After taking this module, students will understand internationally recognized project management methods and tools in all phases of the life cycle and be able to apply these in practice. They will understand the difference between document-based and model-based information management.</p> <p>They will be familiar with ways of using product modeling technologies for design, cost planning, constructability analysis, energy simulations and the visualization of three-dimensional spaces. They will be able to improve product data management for the entire building life cycle and utilize this to support the use and maintenance of buildings in a variety of ways.</p>
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	<p>No admission requirements</p> <p>50 points are awarded for a test (Unit A, Project Management) and 50 are awarded for a draft (Unit B, Building Information Modeling)</p>

Module name	Energy performance of buildings
Credits	9
Module aims and skills	In this module, the students will develop a knowledge base in energy balance in buildings. With a grounding in energy generation, distribution, storage and use, they will be able to apply simple methods to practical examples. They will therefore be able to optimize energy consumption in existing and new buildings in terms of the interaction between building envelope and building technology.
Type of examination	Written examination
Graded	Yes

Module examination: admission requirements	No admission requirements
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Module name	Lecture series: building and district structures – modifications for sustainability and energy management
Credits	6
Module aims and skills	The students will be able to follow and identify key facts from expert presentations on the technological, economic, social and environmental dimensions of problems in energy-focused planning and construction processes in individual buildings and across neighborhoods.
Type of examination	--
Graded	No
Module examination: admission requirements	Not applicable

Module name	Introduction project
Credits	6
Module aims and skills	After taking this module, students will be able - with support - to evaluate a small project from both an energy and an economic perspective.
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	No admission requirements 50 points are awarded for a written thesis and 50 for an oral presentation.

Module name	Interdisciplinary project
Credits	12
Module aims and skills	After taking this module, students will be able to independently evaluate a complex project from an energy and an economic perspective.
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	No admission requirements 50 points are awarded for a written thesis and 50 for an oral presentation.

Module name	Energy-efficient societies
Credits	6
Module aims and skills	After taking this module, students will: <ul style="list-style-type: none"> - Understand a variety of conceptions and societal impacts of energy efficiency - Be able to analyze good and bad practice in project management (including in their own project work) - Be able to engage with a complex range of stakeholders (experts, contractors, users in various project contexts) - Be able to apply conflict management methods (i.e. communication, participation and cooperation) - Know the possible roles and job profiles for graduates of the degree
Type of examination	Portfolio evaluation
Graded	Yes

Module examination: admission requirements	No admission requirements 50 points are awarded for a group presentation and 50 for an individual term paper
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Module name	Real estate economics
Credits	6
Module aims and skills	After taking this module, students will be able to understand and apply key concepts in real estate finance and investment that are relevant for operations and management decisions. They will have a grounding in financial mathematics and be able to calculate simple real estate development projects as part of feasibility studies.
Type of examination	Written examination
Graded	Yes
Module examination: admission requirements	No admission requirements

Module name	Life cycle management (facility management)
Credits	6
Module aims and skills	After taking this module, students will be able to apply relevant methods and the theories behind them as well as services and client needs as management concepts. They will be able to take decisions in order to organize facility management and related business processes according to the needs of the building owners and users.
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	No admission requirements 51 points are awarded for a written examination and 49 for a written composition.

Compulsory elective modules

Module name	Integration of renewable energies
Credits	6
Module aims and skills	After taking this module, students will know the various ways in which a building and a neighborhood can be supplied with renewable energy (i.e. heating, cooling, electricity). They will be able to plan the use and operation of relevant technologies with the focus on energy management, both in terms of existing and expected future standards. This will provide them with a grounding in the uses and limits of renewable energies in buildings.
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	No admission requirements 30 points are awarded for a written composition, 20 for a presentation and 50 for an oral examination.

Module name	Smart buildings
Credits	6
Module aims and skills	After taking this module, students will understand the core principles of flexible and intelligent energy management in modern living spaces. They will be familiar with the details of holistic energy performance calculations, such as

	building configuration, users and use, monitoring, control and automation and decentralized electricity generation. They will be able to explain the relationship with external factors such energy generation, energy supply, and legal and economic frameworks for construction and operations from a smart building perspective. They will be able to determine and evaluate the impacts of smart building design and identify alternatives in terms of energy efficiency. They will be able to compare this with other measures.
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	No admission requirements 30 points are awarded for a written composition, 20 for a presentation, 25 for an oral discussion and 25 for a project (result, documentation and discussion).

Module name	Innovation and technology management
Credits	12
Module aims and skills	After taking this module, students will: <ul style="list-style-type: none"> - Understand the key concepts and principles of innovation and technology management - Understand the interplay between innovation and technology management - Be familiar with innovation management methods and innovation projects - Be able to apply creativity and presentation techniques focusing on the successful development and presentation of innovation projects - Be capable of carrying out and organizing interdisciplinary group project work - Be able to systematically prepare the implementation of innovation projects in order to develop a first prototype
Type of examination	Portfolio evaluation
Graded	Yes
Module examination: admission requirements	No admission requirements 60 points are awarded for an oral presentation of the prototype or business plan and 40 are awarded for a written project report.

The graded modules and the grade of the final dissertation form part of the final grade without a separate weighting.