

Appendix 12

Degree-specific appendix Sustainable Renewable Energy Technologies

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- Reading version

Supplement to § 2 Study Objectives

The Master course of studies Sustainable Renewable Energy Technologies aims at imparting fundamental and diverse knowledge about processes of energy conversion in Renewable Energy technologies.

Consequently, PPRE conveys detailed knowledge about the functionalities of complete systems, consisting of energy converter, storage and consumer. Students gain knowledge about classic measuring equipment and, eventually, are able to take measurements and to analyze, evaluate and present large amounts of data.

The Master course offers three different specialization topics: Solar Energy, Wind Energy and System integration of Renewable Energy. Through these students obtain a profound knowledge in the field of their choice.

Students gain the ability to investigate and evaluate socially and economically relevant issues around the implementation of Renewable Energy technologies as well as criteria of their sustainability.

Students are enabled to do independent, interdisciplinary and problem-oriented scientific work responsibly and to show the results in a coherent way.

The programme increases the students' ability to cooperate in international multidisciplinary workgroups.

The goal of PPRE is to train skilled scientists and experts who are able to work their way into the various areas and issues of Renewable Energy and become specialists in their respective fields. These fields include research, planning and development, working in regional or international developmental organisations and, finally, dealing with interdisciplinary issues of sustainability concerning future systems of energy supply.

Supplement to § 9 Admission to Modules and Module Examinations

To (6): Active Participation (according to § 9 para. 6 MPO)

Seminars, exercises or colloquia are teaching and learning types in which the students acquire a significant fraction of the knowledge and skills to be obtained via dialog and discursive methods involving students and teachers. Build-up of competence and therewith achievement of the objectives of the course are only possible when students participate regularly and actively in the course (compare. § 7 para. 4 sentence 1 NHG).

As a prerequisite for the awarding of credit points an "active participation" may be constituted in modules with courses which convey the teaching content practically or mainly via the dialog of students and teachers (e.g. laboratories, exercises, seminars, excursions). The performance of the active participation are not marked. Active participation according to § 9 para.6 MPO is the regular, documented and successful participation in the courses resp. appropriate sections of courses. The corresponding criteria for active participation will be constituted in the beginning of the course in discourse with the students, presented transparently and noted down in written word; here the estimated workload is to be displayed and put into appropriate relation to the total workload of the course resp. the module. Types of active participation are for example the preparation of solutions to practical or discussion motivating exercises, the report writing to performed experiments resp. practical

tasks, the constructive participation at discussions in seminars or presentations of tasks resp. contents in the resp. course in type of short reports. The decision whether or not the criteria for successful active participation are fulfilled is made by the teacher. In modules in which active participation is constituted details are given in table §10 column Examinations.

Supplement to § 10 Structure and Content of the Modules

The following compulsory modules must be studied:

Module name	Course types	CP	Examinations
pre014 Fundamentals for Renewable Energy	lecture, exercise, laboratory	6	2 examinations (weight 50% each) according to the supplement to §11 Types of Module Examinations
pre017 Physical Principles of Renewable Energy Converters	lecture, exercise, laboratory	6	1 examination according to the supplement to §11 Types of Module Examinations
phy641 Energy Resources and Systems	lecture, exercise	6	2 examinations (weight 50% each) according to the supplement to §11 Types of Module Examinations
pre022 Solar Energy	lecture, exercise	6	2 examinations (weight 50% each) according to the supplement to §11 Types of Module Examinations
pre025 Wind Energy and Storage	lecture, exercise	6	2 examinations (weight 50% each) according to the supplement to §11 Types of Module Examinations
pre041 Sustainability of Renewable Energy	lecture, seminar, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
pre051 Renewable Energy Systems Laboratory and Modelling	lecture, laboratory, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
pre064 Renewable Energy Complementary Topics and Transferrable Skills	lecture, seminar, exercise,	6	2 examinations according to the supplement to §11 Types of Module Examinations: The module is not marked, but 2 of the possible course options must be passed in order to pass the module.
pre071 Internship	internship, seminar, exercise	9	1 examination according to the supplement to §11 Types of Module Examinations
pre081 Renewable Energy Project	lecture, seminar, excursion, exercise	9	2 examinations according to the supplement to §11 Types of Module Examinations: (Group) Presentation of a Paper (weight 2/3) and Portfolio (weight 1/3)
pre152 Resilient Energy Systems	lecture, seminar, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
pre042 Water and Biomass Energy	lecture, seminar, exercise	6	2 examinations (weight 50% each) according to the supplement to §11 Types of Module Examinations
Total Mandatory Modules		78	

Elective Modules (12 CP)			
Students must choose a specialisation of 12 CP consisting of two compulsory elective modules of 6 CP each. It is not possible to credit two modules from different specialisations as one specialisation.			
Specialisation: Solar Energy			
phy609 Photovoltaic Physics	lecture, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
pre113 Photovoltaics Systems	lecture, seminar, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
pre114 Solar Energy Meteorology	lecture, seminar, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
Specialisation: Wind Energy			
phy648 Wind Resources and its Applications	lecture, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
phy649 Design and Simulation of Wind Turbine	lecture, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
phy616 Computational Fluid Dynamics	lecture, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
phy987 Control of Wind Turbines and Wind Farms	lecture, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
Specialisation: System Integration of Renewable Energy			
phy647 Future Power Supply Systems	lecture, seminar	6	1 examination according to the supplement to §11 Types of Module Examinations
inf511 Smart Grid Management	lecture, seminar	6	1 examination according to the supplement to §11 Types of Module Examinations

In all modules the oral exam is accepted as examination type especially for repetitions of examinations.

Supplement to § 11 Types of Module Examinations

To (15): The following other examination types are accepted as module examinations:

- Conference contributions: A conference contribution comprises the preparation and presentation of a scientific paper and a conference presentation on the contents of the module in group work. The learning objective here is the joint preparation and communication of scientific findings to the appropriate audience using common media. A joint group grade is awarded for the conference contribution.

The type and scope of the examination performances must be in proportion to the number of credit points to be awarded. Module examinations in modules with 6 or 12 credit points should generally have the following scope:

- Written examinations approx. 90 min,
- Oral examination approx. 20 min,
- Presentation approx. 10 pages of written argument and approx. 15 min lecture,
- Term paper approx. 15 pages,
- Internship report approx. 15 pages,
- Presentation approx. 20 min,
- Seminar paper approx. 15 pages
- Practical exercises approx. 6 exercises
- Conference contribution approx. 15 min presentation and approx. 8 pages of written discussion

- A portfolio comprises 2 to 5 performances (in particular thesis paper (a), short presentation (b), exercises (c), short oral exam (d), short written exam (e), protocol (f), review (g), learning diary (h)). The performances of a portfolio may not exceed the usual scope of an individual examination performance in their entirety.
 - a) A thesis paper is an independent written discussion of a subject-specific problem of 500 to 2000 words.
 - b) A short presentation corresponds to the presentation in paragraph 7 with a length of 500 to 2000 words and a presentation duration of approx. 10 minutes.
 - c) When working on exercises, the student shall demonstrate that he or she can solve the problems scientifically on the basis of the contents and methods learned. The exercises are published via the online learning environment and are to be completed within the specified time limit. As a rule, the processing time of the exercise tasks should not exceed 30 hours in total.
 - d) A short oral examination usually lasts about 10 minutes per candidate. The essential subjects of the examination and the assessment of the examination performance shall be recorded in a protocol.
 - e) In a short examination, the candidate to be examined shall demonstrate under supervision that he or she can in a limited time, with limited aids and with the usual methods of the subject of the subject in a limited amount of time. The duration is usually 30 to 45 minutes.
 - f) A protocol is a written report on a practical experiment of between 500 to 2000 words.
 - g) A review is a written paper on the evaluation of a subject-specific article of 500 to 2000 words.
 - h) A learning diary is an independent documentation of one's own learning progress in written form of 500 to 2000 words.

Supplement to § 15 Repetition of Module Examinations, Free-Trial Examinations

To (5): Free trial examinations to improve grades are excluded.

Supplement to § 21 Master Dissertation

To (4) The Master's thesis can be written in German or English.

To (10): The final colloquium generally consists of a 20-minute presentation and a 10-minute defence.

To (11): The overall grade for the Master's dissertation module is comprised of both parts of the module and is weighted according to the credit points (80% Master's dissertation and 20% final colloquium).