

## **Subject-specific enclosure 12 Sustainable Renewable Energy Technologies**

### **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

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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:

<b>Module name</b>	<b>Course types</b>	<b>CP</b>	<b>Examinations</b>
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	6	1 examination 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	6	1 examination according to the supplement to §11 Types of Module Examinations
pre051 Renewable Energy Systems Laboratory and Modelling	lecture, laboratory	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	9	1 examination according to the supplement to §11 Types of Module Examinations
pre081 Renewable Energy Project	lecture, seminar, excursion	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	6	1 examination according to the supplement to §11 Types of Module Examinations
pre042 Water and Biomass Energy	lecture, seminar		2 examinations (weight 50% each) according to the supplement to §11 Types of Module Examinations
<b>Total Mandatory Modules</b>		<b>78</b>	

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<b>Elective Modules (12 CP)</b>			
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.			
<b>Specialisation: Solar Energy</b>			
phy609 Photovoltaic Physics	lecture, exercise	6	1 examination according to the supplement to §11 Types of Module Examinations
pre113 Photovoltaics Systems	lecture, seminar	6	1 examination according to the supplement to §11 Types of Module Examinations
pre114 Solar Energy Meteorology	lecture, seminar	6	1 examination according to the supplement to §11 Types of Module Examinations
<b>Specialisation: Wind Energy</b>			
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
<b>Specialisation: System Integration of Renewable Energy</b>			
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 or 180 min,
- Oral examination approx. 20 min or 45 min,
- Presentation approx. 10 pages or 20 pages of written argument and approx. 15 min or 30 min lecture,
- Term paper approx. 15 or 30 pages,
- Internship report approx. 15 or 30 pages,

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- Presentation approx. 20 min or 45 min,
- Seminar paper approx. 15 or 30 pages
- Practical exercises approx. 6 or 12 exercises
- Conference contribution approx. 15 min or 30 min presentation and approx. 8 pages or 15 pages of written discussion

**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 defense.

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).

**Supplement to § 23**  
**Overall Result**

To (3): For the determination of the overall result, all module grades have to be considered.