

*Note: The only legally binding version of the directives and regulations of the Technische Universität Wien is the German version published in the University Gazette of TU Wien. The English version provided here is intended as a service (guide) for our international staff members and doesn't replace the German version.*

Curriculum of the postgraduate program

## **Renewable Energy Systems (MSc)**

at TU Wien  
in cooperation with Energiepark Bruck/Leitha

Decided by the Senat of TU Wien at the sitting  
on October 17, 2016

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## Curriculum for the postgraduate program (MSc) Renewable Energy Systems

### § 1 Basis and scope of application

This curriculum defines and regulates the postgraduate program MSc Renewable Energy Systems at Technische Universität Wien. It is based on the Universities Act (UG) (Austrian Federal Law Gazette BGBl. I no. 120/2002) and the provisions of the Statute of TU Wien as amended. The structure and design of the program are oriented towards the qualification profile pursuant to § 2.

### § 2 Qualification profile

The postgraduate program MSc Renewable Energy Systems provides a deepened education with a high-quality scientific and methodical basis, oriented towards lasting knowledge, which makes graduates internationally competitive, and enables them to complete a further qualification and to take up a career in, for example, the following fields of activity:

- the design of plants for the use of renewable energy sources;
- the financing and economic efficiency of plants for the use of renewable energy;
- the handling of funding measures of plants for the use of renewable energy;
- legal permits for plants for the use of renewable energy;
- the operation of plants for the use of renewable energy, and
- environmental valuation in connection with renewable energy.

On the basis of the professional requirements, qualifications in the following categories are provided in the postgraduate program (MSc) Renewable Energy Systems:

- Graduates have acquired knowledge of the functions and modes of action of various technologies and are able to operate facilities for the use of renewable sources of energy in an economically and technically feasible manner.
- Graduates possess the specialist decision-making competence to plan the use of technologies to use renewable energy.
- Graduates possess critical awareness with regard to (new) findings and developments in the possible uses of renewable energy. On this basis, they are able to plan projects, assess them from an economic, legal, technical, and ecological perspective and evaluate their feasibility.
- Graduates can use the project management instruments with which they have become familiar and implement energy projects independently and on their own authority. They are able to adapt existing knowledge to specific situations and circumstances with an analytical and creative approach.
- Graduates think and act in an integrated and disciplinary manner. They are able to suggest creative solutions and to assess these professionally with their analytical abilities. They can evaluate future developments for renewable energy technologies and design projects clearly on this basis.
- Graduates are able to lead interdisciplinary teams and to make relevant management decisions. In addition, they can develop and implement efficient, locally oriented strategies in an intercultural working environment.

### § 3 Duration and scope

The workload for the postgraduate program (MSc) Renewable Energy Systems comprises 105 ECTS credit points. The intended length of studies is four semesters.

### § 4 Admission to the program

Applicants are admitted to the postgraduate program as "außerordentliche/r StudentIn".

#### **Admission criteria at TU Wien:**

- 1) Completion of a subject-related study program in technical and natural sciences, economics or law at a recognized Austrian or foreign post-secondary institutes of education.
- 2) Relevant work experience with a set minimum duration of two years.
- 3) Proof of adequate knowledge of English as the language of instruction; in particular, proof of this knowledge is considered to be provided with the general university entrance qualification, with at least B2 CEFR, with internationally recognized certificates such as CAE (at least 45 points), FCE (at least C), TOEFL iBT (at least 87 points) or IELTS (at least 5.5). Proof can also be provided as part of the admission interview. Applicants with the relevant native language do not need to provide this proof.
- 4) In justified exceptional cases, persons may also be admitted who do not fulfill the prerequisites listed under 1), but who possess a comparable qualification and the general university entrance qualification on the basis of their professional activities, experience, and achievements, and who can provide proof of at least 60 ECTS credit points from successfully completed relevant courses.
- 5) In addition, the following documents must be submitted:
  - a) a completed application form;
  - b) a résumé;
  - c) proof of identity;
  - d) a cover letter, and
  - e) references, if any.

The Dean of Studies for Continuing Education shall make the final decision on whether the admission requirements 1) or 4) as well as 2) and 5) have been fulfilled.

Applicants who fulfill the abovementioned admission requirements shall be invited to an admission interview in the second stage of the admission procedure. This interview shall be held by the academic director and the program manager or their deputies on the part of TU Wien.

As part of the admission interview,

- a) applicants are informed about the structure and planned implementation of the postgraduate program;
- b) applicants must provide proof of adequate knowledge of the languages of instruction if they have not already done so pursuant to item 3), and
- c) applicants must present their personal motivation for participating in the program as well as their wish to complete the program, and their social competence (ability to work in a team, etc.), their motivation for achievement, their resilience, independence, and social commitment (charity work, etc.), among others.

The Dean of Studies for Continuing Education shall rank the qualified applicants on the basis of the documents submitted and the results of the admission interviews. Up to 50% of the designated study places may already be allocated definitively at an earlier, specified date.

The remaining places shall not be allocated until after the deadline for submissions. The ranking shall again be made on the basis of the documents submitted and the results of the admission interviews; in

the case of approximately equivalent qualifications, the qualified applicants shall be ranked in the order that the applications were received.

At the applicant's request, a notice shall be issued after the admission procedure has been completed if he/she was not admitted to a postgraduate program.

## § 5 Structure of the degree program

The content and qualifications of the program are provided in modules. A module is a teaching and learning unit characterized by the initial and final qualifications, the content, the forms of teaching and learning, the standard workload, and the performance assessment. Modules are completed in the form of individual or several content-related courses. The modules listed below also correspond to the examination subjects of the program, the name, scope, and overall assessment of which shall be shown on the degree certificate.

The postgraduate program MSc Renewable Energy Systems contains the following modules/examination subjects:

- Introduction on Renewable Energy
- Biomass, Biofuels, and Biogas
- Solar Energy – Solar Heating and Photovoltaics
- Geothermal Energy, Wind Power, and Small Hydro
- Efficient Energy Use and Thermal Building Optimization
- General Legal and Economical Frameworks
- Integration of Renewable Energy Sources into the Energy System
- Management and Soft Skills
- Perspectives on the Use of Renewable Energy
- Master's Thesis

In the modules of the postgraduate program (MSc) Renewable Energy Systems, the following content (subject matter) is taught:

**Introduction on Renewable Energy (3 semester hours / 3 ECTS credit points):** The module provides basic knowledge and an overview on renewable energy sources and technologies. Students develop an understanding of the use and distribution of primary energy. The basic concepts of the energy sector and power plants are discussed, as well as EU research projects and funding policies with regard to renewable energy. Students gain an insight into how grids work, and learn about their possibilities and weaknesses. A central learning objective is an understanding of how various electricity generation technologies influence the distribution networks and how both these aspects can be linked. Team building and a short introduction to scientific work are further components of the module.

**Biomass, Biofuels, and Biogas (6 semester hours / 15 ECTS credit points):** The module provides students with an in-depth and comprehensive understanding of biomass use. They learn which energy crops are available, and how these grow and are processed. In addition, the available technologies for the conversion of biomass into energy carriers are presented (e.g.: biomass heating plants, biodiesel and biogas power plants). Furthermore, the basics of designing, implementing, and maintaining these technologies are taught. Students are able to evaluate the costs and risks of biomass use and to select the best available technology for the respective project.

**Solar Energy – Solar Heating and Photovoltaics (4 semester hours / 10 ECTS credit points):** The focus of the module is the use of solar energy. Students learn the technical basics of the conversion of solar energy (heat and electricity). In particular, the applications in the area of solar thermal energy and photovoltaics are presented. Furthermore, the basics of designing, implementing, and maintaining these technologies are taught. Students are able to evaluate the costs and risks of solar energy and to select the best available technology for the respective project.

**Geothermal Energy, Wind Power, and Small Hydro (6 semester hours / 15 ECTS credit points):** In the module, students acquire deeper knowledge of the use of geothermal energy, wind power, and

hydropower. The technical basics of the energy conversion of these energy sources are taught. The focus is on district heating, energy production from district heating, wind power, and hydropower. Furthermore, the basics of designing, implementing, and maintaining the relevant technologies are taught. Students are able to evaluate the costs and risks and to select the best available technology for the respective project.

**Efficient Energy Use and Thermal Building Optimization (4 semester hours / 8 ECTS credit points):** In the module, students acquire a basic understanding of the EU Energy Efficiency Directive and its effects on the energy sector. In addition, the basics of building physics and methods of energy conservation in building optimization are taught. Students learn why and how the energy performance certificate for buildings is calculated according to the EU Energy Performance of Buildings Directive. Another focus is the development of regional and municipal energy concepts and the schemes for awarding energy contracts in companies and municipalities.

**General Legal and Economical Frameworks (4 semester hours / 8 ECTS credit points):** Students acquire a basic understanding of the most important legal and economic aspects of projects in the area of renewable energy. Students learn to draw up business and financial plans independently and are able to use the relevant project management instruments for projects in the field of renewable energy. The corresponding, relevant legal regulations at the level of the EU or at a national level are taught, and students are able to recognize these and to observe them accordingly. Another focus of the module is the financing of projects in the field of renewable energy through public–private partnerships and the current systems of emissions trading. In addition, students learn more about the current feed-in tariffs and other funding and taxes with regard to renewable energy.

**Integration of Renewable Energy Sources into the Energy System (7 semester hours / 9 ECTS credit points):** In the module, students are taught the technical and economic mechanisms to understand the strategies for integrating technologies and storing renewable energy. They acquire an understanding of the role, responsibilities and structures of electricity networks. In addition, they learn how sustainable and secure electricity supplies can also be ensured in the future. Systems of direct marketing of green energy as well as energy balance and balancing markets are explained. Part of the module is also formed by country modules in which the students are taught on location in order to understand the strengths and potentials, the future development, and the integration of renewable energy systems into the energy system and to learn more about these markets and the investment perspectives.

**Management and Soft Skills (4 semester hours / ECTS credit points):** Students learn how the integration of soft skills, which are important for implementing projects in the field of renewable energy, is of significance. The emphasis is on the process of team building and how the public can be involved in renewable energy projects. Graduates will be able to work together with the media accordingly and also to realize projects in times of crisis and conflict. In addition, they acquire the abilities to present projects publicly and also to defend them accordingly.

**Perspectives on the Use of Renewable Energy (2 semester hours / 3 ECTS credit points):** In the module, students acquire a basic understanding of energy modelling and its areas of application. Another focus of the module is the future trends and developments in the area of the production, distribution, and consumption in the field of renewable energy. Additionally, the influence of renewable energy projects with regard to climate change and the environment is considered.

**Master's Thesis (2 semester hours / 30 ECTS credit points):** The module consists of the Master's Thesis and an accompanying seminar. The Master's Thesis is an academic thesis that serves as proof of the student's ability to work on a topic independently and with academic grounding in terms of content and methodology. In principle, the topic of the Master's Thesis shall be chosen – in accordance with the qualification profile – in such a way that the participants work on or solve a specific practical problem using the knowledge, skills, and competences taught in the degree program. In the accompanying seminar, the necessary methods and presentation techniques for carrying out the Master's Thesis are taught, and the results from the Master's Thesis are presented by the students.

## § 6 Courses

The subject areas of the modules are taught in courses. The courses of the individual modules are specified in the module descriptions of the annex. Courses are assessed through examinations according to the UG. The types of course assessments are determined in the examinations regulations (§ 7).

Any changes to the courses of the modules is documented in the record of the modules and is to be understood by transitional provisions. Any changes are published in the University Gazettes of TU Wien. The currently valid record of the modules is available in the CEC (Continuing Education Center).

## § 7 Examination regulations

The postgraduate program is successfully completed by

- a. attaining a positive assessment of all the modules prescribed in the curriculum, whereby a module is considered to have been positively assessed when the courses to be assigned to the module pursuant to the module description have been positively assessed, and
- b. attaining a positive assessment of the Master's Thesis.

The degree certificate contains

- a. the examination subjects including their ECTS credit points and their assessments;
- b. the topic and assessment of the Master's Thesis, and
- c. the overall assessment based on the assessments listed under a) and b) pursuant to § 73 para. 3 UG.

The grade of a module is to be determined by averaging the grades of the courses to be assigned to the module, whereby the grades are weighted on the basis of the ECTS credit points of the courses. The grade must be rounded down if the decimal place is lower than 0.5. Otherwise, the grade must be rounded up.

Courses held as lectures (VO) are assessed on the basis of a final oral and/or written examination. All other courses are courses with continual assessment, i.e. a student's performance is assessed continually on the basis of an accompanying performance review and also optionally on the basis of an additional final partial examination.

Examinations with positive results are to be assessed as "very good" (1), "good" (2), "satisfactory" (3) or "sufficient" (4); those with negative results are to be assessed as "insufficient" (5).

## § 8 Degree program regulations

Students of the postgraduate program (MSc) Renewable Energy Systems should be able to complete their program with a reasonable workload in the intended time period.

The officer responsible for study matters shall decide on the recognition of already completed academic achievements.

## § 9 Master's Thesis

The Master's Thesis is an academic thesis that serves as proof of the student's ability to work on a scientific topic independently and with academic grounding in terms of content and methodology. The examination subject Master's Thesis is assessed with 30 ECTS credit points.

The topic of the Master's Thesis may be freely chosen by the student and must correspond to the qualification profile.

## § 10 University degree

Graduates of the postgraduate program (MSc) Renewable Energy Systems are awarded the university degree of “Master of Science”, abbreviated: “MSc”, pursuant to UG § 58 subpara. 1.

## § 11 Integrated quality management

Integrated quality management ensures that the curriculum for the postgraduate program (MSc) Renewable Energy Systems is designed in a consistent manner, is implemented efficiently and is reviewed or checked regularly. Suitable measures ensure the relevance and topicality of the curriculum and the individual courses over time; the officer responsible for study matters and the Curricular Committee are in charge of defining and monitoring them.

The academic director shall report at regular intervals to the Dean of Studies for Continuing Education of TU Wien on the results and, where appropriate, shall make suggestions for optimizing the quality of the program; the Dean of Studies for Continuing Education of TU Wien shall report to the Curricular Committee at least once per academic year. For the purpose of quality assurance, regular feedback events – at least once per academic year and after completion of the program – shall be provided for by the academic director. After every course, students shall be given the possibility of making an anonymous evaluation using a questionnaire. This course evaluation provides individual feedback on the implementation of the program for the officer responsible for study matters, as well as an overall picture of the implementation of the curriculum for all participants. In particular, conspicuous courses can be identified in this way, and suitable adjustment measures can be derived and implemented through coordination between the officer responsible for study matters, the Curricular Committee, and the course director.

The Curricular Committee conducts regular monitoring of the curriculum, taking into account scientific aspects and external factors, and reviewing the workloads to identify potential improvements to the curriculum and to ensure topicality.

## § 12 Legal validity

This curriculum shall come into effect on November 1, 2016.

## § 13 Transitional provisions

The transitional provisions shall be announced separately in the University Gazette and are available in the CEC.

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### ***Introduction on Renewable Energy***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

3

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students master the essential foundations of physics and chemistry in the field of energy. In addition to this, they are able to describe the fundamentals of the energy industry and energy markets.*
- *Students are able to explain how renewable energy technologies work and gain an insight into the associated opportunities and potential.*
- *Furthermore, they are able to set out a cost and risk analysis for the use of assets to exploit renewable forms of energy.*
- *Students are able to identify energy systems in the fields of both renewable and conventional energy sources.*
- *They are able to describe the mechanisms and processes involved in the conversion of primary energy and the provision of useable energy and energy services.*
- *Students are able to evaluate and compare, from an economic, technical and ecological point of view, different energy generation technologies based on renewable resources.*

Inhalte des Moduls (Syllabus)

- *Introduction & renewable energy*
- *Basics of energy & power*
- *Energy perspectives and the environment*
- *Potentials of RES & promotion instruments and policy strategies for RES*
- *Economics of electricity generation from renewables*
- *International survey on heating, transport and electricity*
- *Introductory soft skills & how to write scientific papers*

Erwartete Vorkenntnisse (Expected Prerequisites)

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|  |      |                                |
|--|------|--------------------------------|
| Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)  |      |                                |
| --   |      |                                |
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)  |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation</i></li> <li>• <i>Group assignments</i></li> <li>• <i>Discussion</i></li> <li>• <i>Case studies</i></li> <br/> <li>• <i>Module-examination: Prereading, Participation in class, Written assignment (Calculation examples), Written examination (MC test)</i></li> </ul> |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)   | ECTS | Semesterstunden (Course Hours) |
| <i>Introduction on Renewable Energy (VO)</i>   | 3    | 3                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

***Biomass, Biofuels, and Biogas***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

15

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students master the essential foundations of physics and chemistry in the field of bioenergy sources (biomass/biogas/biofuels).*
- *Students are able to explain in principle the function of bioenergy technologies, as well as of installations for utilising these energy sources.*
- *Students are able to support and evaluate bioenergy projects from a technical point of view as well as assess them in the light of cost-effectiveness.*
- *They are able to use tools for the cost and risk analysis of projects in the field of bioenergy sources and prepare and explain the results to specific target groups.*
- *They are able to analyse and evaluate not only the potential, but also the limitations of the use of bioenergy sources.*
- *Students are acquainted with tools and methods for Life Cycle Assessment (LCA) and are able to use and apply them.*
- *Students are able to implement energy projects in the field of bioenergy sources, both independently and taking full responsibility for their work. They are able to adapt existing knowledge to specific situations and circumstances and proceed analytically and creatively in these situations.*
- *On the basis of what has been learned, they are able to independently determine the most appropriate bioenergy technology for a given site, taking account of the relevant data and principles (site selection).*
- *They are able to address and evaluate, from an economic, technical and environmental point of view, different energy supply technologies based on bioenergy sources.*

|   |      |                                |
|---|------|--------------------------------|
| Inhalte des Moduls (Syllabus)   |      |                                |
| <ul style="list-style-type: none"> <li>• <i>General introduction to environmental challenges for bioenergy – Life cycle assessment &amp; ecological resource management</i></li> <li>• <i>Fundamentals of thermal biomass utilization &amp; planning, constructing and implementing of plants for the use of biomass &amp; operation, maintenance, economic evaluation and risk aspects of biomass utilization</i></li> <li>• <i>Plant engineering for the energetic use of biomass-fuel (biodiesel, ethanol, 2nd generation)</i></li> <li>• <i>Planning, construction &amp; implementation of biogas plants &amp; operation maintenance, economic evaluation and risk aspects of biogas plants</i></li> <li>• <i>Biogas upgrading and feed into the gas grid</i></li> <li>• <i>Practical examples</i></li> </ul> |      |                                |
| Erwartete Vorkenntnisse (Expected Prerequisites)  |      |                                |
| ---   |      |                                |
| Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)   |      |                                |
| <i>Successful participation in the preceding module „Introduction on Renewable Energy“.</i>   |      |                                |
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)   |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation</i></li> <li>• <i>Group assignments</i></li> <li>• <i>Discussion</i></li> <li>• <i>Case studies</i></li> </ul> <ul style="list-style-type: none"> <li>• <i>Module-examination: Prereading, Participation in class, Homework, Written examination (MC test)</i></li> </ul>  |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)  | ECTS | Semesterstunden (Course Hours) |
| <i>Biomass, Biofuels, and Biogas (VU)</i>   | 15   | 6                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### ***Solar Energy – Solar Heating and Photovoltaics***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

10

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students master the essential foundations of physics and chemistry in the field of solar energy (solar thermal/photovoltaic).*
- *Students are able to explain in principle the function of solar energy technologies, as well as of installations for the use of these energy sources.*
- *Students are able to support and evaluate solar energy projects from a technical point of view as well as assess them in the light of cost-effectiveness.*
- *They are able to use tools for the cost and risk analysis of projects in the field of solar energy and prepare and explain the results to specific target groups.*
- *They are able to analyse and evaluate not only the potential, but also the limitations of the use of solar energy.*
- *Students are able to implement energy projects in the field of solar energy sources, both independently and taking full responsibility for their work. They are able to adapt existing knowledge to specific situations and circumstances and proceed analytically and creatively in these situations.*
- *On the basis of what has been learned, they are independently able to determine the most appropriate solar energy technology for a given site, taking account of the relevant data and principles (site selection).*
- *They are able to address and evaluate, from an economic, technical and environmental point of view, different energy supply technologies based on solar energy.*

Inhalte des Moduls (Syllabus)

- *Physical principles of the use of solar energy*
- *Potentials*
- *Plant engineering for the use of solar energy (electric, thermal)*
- *Planning, construction, implementation, operation and maintenance of photovoltaic systems*
- *Economic evaluation, risk and cost aspects*
- *Practical examples*

Erwartete Vorkenntnisse (Expected Prerequisites)

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Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)

*Successful participation in the preceding module „Introduction on Renewable Energy“.*

Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)

- *Lecture*
- *Presentation*
- *Group assignments*
- *Discussion*
- *Case studies*
  
- *Module-examination: Prereading, Participation in class, Homework, Written examination (MC test)*

| Lehrveranstaltungen des Moduls (Courses of Module)         | ECTS      | Semesterstunden (Course Hours) |
|--|-----------|--------------------------------|
| <i>Solar Energy – Solar Heating and Photovoltaics (VU)</i> | <i>10</i> | <i>4</i>                       |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### ***Geothermal Energy, Wind Power, and Small Hydro Power***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

15

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students master the essential foundations of physics and chemistry in the field of geothermal, wind and hydropower energy.*
- *Students are able to explain in principle the function of geothermal, wind and hydropower technologies, as well as of installations for the use of these energy sources.*
- *Students are able to support and evaluate geothermal, wind and hydroelectric projects from a technical point of view as well as assess them in the light of cost-effectiveness.*
- *They are able to use tools for the cost and risk analysis of projects in the field of geothermal, wind and hydropower energy and prepare and explain the results to specific target groups.*
- *They are able to analyse and evaluate not only the potential, but also the limitations of the use of geothermal energy, wind energy and hydropower.*
- *Students are able to implement energy projects in the field of geothermal energy, wind energy and hydropower, both independently and taking full responsibility for their work. They are able to adapt existing knowledge to specific situations and circumstances and proceed analytically and creatively in these situations.*
- *On the basis of what has been learned, they are able to independently determine the most appropriate geothermal, wind and hydropower technology for a given site, taking account of the relevant data and principles (site selection).*
- *They are able to address and evaluate, from an economic, technical and environmental point of view, different energy supply technologies based on geothermal energy, wind energy and hydropower.*

Inhalte des Moduls (Syllabus)

- *Technical units & physical basic*
- *Geothermal power plant types; power plant components; geothermal resources and potentials*
- *Wind power - Technical systems, management & controlling*
- *Development of planning of wind projects*
- *Pump storage systems for wind power*
- *Off-shore wind parks*
- *Basics of small hydro power*
- *Structural design of SHP plants*
- *Mechanical & electrical equipment of SHPP*
- *Marine power*
- *Practical examples*

|   |      |                                |
|---|------|--------------------------------|
| Erwartete Vorkenntnisse (Expected Prerequisites)  |      |                                |
| ---   |      |                                |
| Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)   |      |                                |
| <i>Successful participation in the preceding module „Introduction on Renewable Energy“.</i>   |      |                                |
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)   |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation</i></li> <li>• <i>Group assignments</i></li> <li>• <i>Discussion</i></li> <li>• <i>Case studies</i></li> <br/> <li>• <i>Module-examination: Prereading, Participation in class, Homework, Written examination (MC test)</i></li> </ul> |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)  | ECTS | Semesterstunden (Course Hours) |
| <i>Geothermal Energy, Wind Power, and Small Hydro Power (VU)</i>  | 15   | 6                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### ***Efficient Energy Use and Thermal Building Optimization***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

8

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students master the essential foundations of physics and chemistry in the field of energy efficiency and building optimisation, specifically construction physics and thermal building design.*
- *Furthermore, they are aware of the EU Energy Efficiency Directive and its impact on the energy sector.*
- *Students are able to calculate heat balances, carry out comparative ecological building reviews and calculate the energy needs of buildings.*
- *They are able to plan local and regional energy strategies taking into account all relevant specifications.*
- *They are able to prepare energy contracts for businesses and communities.*
- *They are able to use tools for the cost and risk analysis of projects in energy efficiency and building optimisation and prepare and explain the results to specific target groups.*
- *Students are able to implement energy projects in energy efficiency and building optimisation, both independently and taking full responsibility for their work. They are able to adapt existing knowledge to specific situations and circumstances and proceed analytically and creatively in these situations.*
- *Furthermore, they are able to classify model regions and to develop, implement and monitor appropriate measures in the energy sector for these regions.*

Inhalte des Moduls (Syllabus)

- *Communal & regional energy concepts; development of measures for model region*
- *Energy performance contract for building refurbishment*
- *Inside & outside climate conditions & thermal comfort; energy demand calculation*
- *Solar architecture - overview, examples, office buildings*
- *Energy efficient mobility & chemical storages*

Erwartete Vorkenntnisse (Expected Prerequisites)

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Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)

***Successful participation in the preceding module „Introduction on Renewable Energy“.***

|   |      |                                |
|---|------|--------------------------------|
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)   |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation</i></li> <li>• <i>Group assignments</i></li> <li>• <i>Discussion</i></li> <li>• <i>Case studies</i></li> <br/> <li>• <i>Mode of examination: Prereading, Participation in class, Calculation assignment, Written assignment (Project &amp; Project Analysis), Written examination (MC test)</i></li> </ul> |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)  | ECTS | Semesterstunden (Course Hours) |
| <i>Efficient Energy Use and Thermal Building Optimization (VU)</i>  | 8    | 4                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### **General Legal and Economical Frameworks**

Regelarbeitsaufwand für das Modul (ECTS-Credits):

8

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students master the basics of accounting, internal corporate accounting and controlling.*
- *They have knowledge of financial instruments, plans and models as well as of support systems and support opportunities, especially in the field of EU programmes.*
- *They are acquainted with and understand the economic importance and the effects of renewable energy technologies on energy systems – for example on the power grid.*
- *Students are able to set out how various energy technologies influence the power grid and how they can be integrated usefully into this.*
- *They recognise the impact of political, legal and economic conditions on the energy sector, understand current developments and are acquainted with selected practical cases and related legal judgments. They recognise legal problems and are able to prevent these. They understand legal principles in the field of renewable energy and are able to consider and apply their essential features.*
- *They are able to independently prepare business and financial plans for energy projects.*
- *Students have an overview in the fields of business law and its fundamental impact on business practice, so that they are able to classify and evaluate new subject matter appropriately.*
- *They are able to use tools for the cost and risk analysis of projects in renewable energy and prepare and explain the results to specific target groups.*
- *Students are able to implement the acquired financial instruments and energy projects, both independently and taking full responsibility for their work. They are able to adapt existing knowledge to specific situations and circumstances and proceed analytically and creatively in these situations..*

Inhalte des Moduls (Syllabus)

- *Principles of accounting*
- *Valuation and financing of energy projects*
- *Business plans for energy projects*
- *PPP models; Tax law*
- *Legal aspects of REN according to the EU regulatory system; Austrian national legal basis for REN*

Erwartete Vorkenntnisse (Expected Prerequisites)

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|  |      |                                |
|--|------|--------------------------------|
| Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)  |      |                                |
| <i>Successful participation in the preceding modules „Introduction on Renewable Energy“, "Biomass, Biofuels, and Biogas", "Solar Energy – Solar Heating and Photovoltaics" and "Geothermal Energy, Wind Power, and Small Hydro Power"</i>  |      |                                |
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)  |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation</i></li> <li>• <i>Group assignments</i></li> <li>• <i>Discussion</i></li> <li>• <i>Case studies</i></li> <br/> <li>• <i>Module-examination: Prereading, Participation in class, Homework (Business Plan - group assignment), Written examination (MC test)</i></li> </ul> |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)   | ECTS | Semesterstunden (Course Hours) |
| <i>General Legal and Economical Frameworks (VO)</i>  | 8    | 4                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### ***Integration of Renewable Energy Sources into the Energy System***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

9

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students have advanced knowledge about the functions of renewable energy technologies and are able to differentiate the associated opportunities and potentials. They are also acquainted with not only the specific features, but also the limitations of the use of renewable energy.*
- *They are able to describe the market integration and storage of renewable energy sources and their direct marketing.*
- *Students are able to set out how the various energy technologies influence the power grid and how they can be integrated usefully into this. They can describe the role, responsibilities and structures of power grids.*
- *Students are able to explain parameters influencing the present and modelling the future energy needs and illustrate scenarios of future technologies and developments.*
- *They are able to use tools for the cost and risk analysis of projects in renewable energy and prepare and explain the results to specific target groups.*
- *Students are able to implement energy projects in the field of renewable energy, both independently and taking full responsibility for their work. They are able to adapt existing knowledge to specific situations and circumstances and proceed analytically and creatively in these situations.*
- *Students analyse the impact of energy projects on the environment, and have a critical awareness of developments in the field of renewable energy. On this basis, they are able to carry out comprehensive reviews of projects.*

Inhalte des Moduls (Syllabus)

- *Basics of electricity grids & the future role and responsibilities of transmission grids*
- *Grid integration of REN and the concepts of smart grids*
- *Electricity markets; marketing integration of REN and storages*
- *Direct marketing of green electricity*
- *Country Modules in selected CEE/SEE-countries*

Erwartete Vorkenntnisse (Expected Prerequisites)

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|  |      |                                |
|--|------|--------------------------------|
| Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)  |      |                                |
| <i>Successful participation in the preceding modules „Introduction on Renewable Energy“, "Biomass, Biofuels, and Biogas", "Solar Energy – Solar Heating and Photovoltaics" and "Geothermal Energy, Wind Power, and Small Hydro Power"</i>  |      |                                |
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)  |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation</i></li> <li>• <i>Group assignments</i></li> <li>• <i>Discussion</i></li> <li>• <i>Case studies</i></li> <br/> <li>• <i>Mode of examination: Prereading, Participation in class, Written assignment (calculation example), Written examination (MC test), Homework (Country Report – group assignment)</i></li> </ul> |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)   | ECTS | Semesterstunden (Course Hours) |
| <i>Integration of Renewable Energy Sources into the Energy System (VO)</i>   | 9    | 7                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### **Management and Soft Skills**

Regelarbeitsaufwand für das Modul (ECTS-Credits):

4

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students are able to present convincingly and use effective tools for leadership, team management and human resources development.*
- *They are able to prepare all information relevant to their professional environment for specific target groups and communicate this in a comprehensible manner.*
- *They are able to manipulate tools designed for effective public relations, taking into account any business-specific aspects and applying these.*
- *Students have the necessary language skills to implement and apply the acquired knowledge and skills, including English-language skills.*
- *They apply project management methods, adapted to their individual professional situation or to operational or other special circumstances. They are able to assess the progress of the project properly.*
- *They lead technical discussions, represent their own points of view and are able to justify this. They recognise conflicts, are able to identify the core problem and develop appropriate solutions.*
- *They are able to lead interdisciplinary teams, give clear instructions, guide and make appropriate management decisions. They can overcome problems or resistance in an intercultural environment.*

Inhalte des Moduls (Syllabus)

- *Successful presentations*
- *Leadership and team management*
- *Public participation*
- *Conflict management*
- *Public Relations*

Erwartete Vorkenntnisse (Expected Prerequisites)

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Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)

*Successful participation in the preceding modules „Introduction on Renewable Energy“, "Biomass, Biofuels, and Biogas", "Solar Energy – Solar Heating and Photovoltaics" and "Geothermal Energy, Wind Power, and Small Hydro Power"*

Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)

- *Lecture*
- *Presentation*
- *Group assignments*
- *Discussion*
- *Case studies*
  
- *Mode of examination: Prereading, Participation in class, Presentation of homeworks or reports, Written assignment (PR activity)*

| Lehrveranstaltungen des Moduls (Courses of Module) | ECTS | Semesterstunden (Course Hours) |
|--|------|--------------------------------|
| <i>Management and Soft Skills (VU)</i>             | 4    | 4                              |

## Modulbeschreibung (Module Descriptor)

Name des Moduls (Name of Module):

### ***Perspectives on the Use of Renewable Energy***

Regelarbeitsaufwand für das Modul (ECTS-Credits):

3

ECTS

Bildungsziele des Moduls (Learning Outcomes)

- *Students are able to identify future trends and developments in the field of production, distribution and consumption of renewable energy.*
- *They are able to analyse and evaluate not only the opportunities and potential, but also the specific features and limitations of their use.*
- *Students are able to explain parameters influencing the present and modelling the future energy needs and illustrate scenarios of future technologies and developments.*
- *Students are able to independently investigate new technologies and their application, as well as assess and evaluate them from an economic, energy and ecological point of view.*
- *Students analyse the impact of new renewable energy technologies on the environment and have a critical awareness of new knowledge and developments in this area. On this basis, they are able to carry out comprehensive reviews of projects.*
- *Students are able to incorporate future developments into their existing knowledge, to make links with what they already know and to implement their own projects on this basis.*

Inhalte des Moduls (Syllabus)

- *Current and future drivers of energy consumption*
- *Perspectives for future technologies (hydrogen, windgas, biorefineries)*
- *Environmental protection and climate change; Overall implications*
- *Future Scenarios for the development of the world energy systems*

Erwartete Vorkenntnisse (Expected Prerequisites)

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Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)

*Successful participation in the preceding modules „Introduction on Renewable Energy“, „Biomass, Biofuels, and Biogas“, „Solar Energy – Solar Heating and Photovoltaics“, „Geothermal Energy, Wind Power, and Small Hydro Power“, „Efficient Energy Use and The*

Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)

- *Lecture*
- *Presentation*
- *Group assignments*
- *Discussion*
- *Case studies*
  
- *Module-examination: Prereading, Participation in class, Written examination (MC test)*

| Lehrveranstaltungen des Moduls (Courses of Module)      | ECTS | Semesterstunden (Course Hours) |
|---|------|--------------------------------|
| <i>Perspectives on the Use of Renewable Energy (VO)</i> | 3    | 2                              |

| Modulbeschreibung (Module Descriptor)  |      |                                |
|--|------|--------------------------------|
| Name des Moduls (Name of Module):  |      |                                |
| <b><i>Master Thesis</i></b>  |      |                                |
| Regelarbeitsaufwand für das Modul (ECTS-Credits):  | 30   | ECTS                           |
| Bildungsziele des Moduls (Learning Outcomes)   |      |                                |
| <i>This module qualifies the students to complete successfully and independently a Master Thesis in a selected topic within the field of Renewable Energies and in accordance with the qualification profile. They are able to apply the acquired knowledge/methods and conduct independent research on a specific and practical problem in the relevant area.</i> |      |                                |
| Inhalte des Moduls (Syllabus)  |      |                                |
| <i>Writing of an academic paper (Master Thesis) on a free selected topic (Ideally, the Master Thesis should have an applied character and practical value is desired. Students are encouraged to choose a specific and practical problem from their occupational activity)</i>   |      |                                |
| Erwartete Vorkenntnisse (Expected Prerequisites)   |      |                                |
| ---  |      |                                |
| Verpflichtende Voraussetzungen für das Modul sowie für einzelne Lehrveranstaltungen des Moduls (Obligatory Prerequisites)  |      |                                |
| <i>Successful participation in the preceding modules „Introduction on Renewable Energy“, „Biomass, Biofuels, and Biogas“, „Solar Energy – Solar Heating and Photovoltaics“, „Geothermal Energy, Wind Power, and Small Hydro Power“, „Efficient Energy Use and Thermal Building Optimization“.</i>  |      |                                |
| Angewandte Lehr- und Lernformen und geeignete Leistungsbeurteilung (Teaching and Learning Methods and Adequate Assessment of Performance)  |      |                                |
| <ul style="list-style-type: none"> <li>• <i>Lecture</i></li> <li>• <i>Presentation Library</i></li> <li>• <i>Introduction Database research</i></li> </ul>   |      |                                |
| Lehrveranstaltungen des Moduls (Courses of Module)   | ECTS | Semesterstunden (Course Hours) |
| <i>Master Thesis</i>   | 27   |                                |
| <i>Master Thesis Seminar</i>   | 3    | 2                              |