

Module XIV – Renewable Energies

Module no. EM 14	Courses: Renewable Energies
----------------------------	------------------------------------

Head of the module:	Prof. Dr Jochen Weilepp
----------------------------	-------------------------

Part of studies:	Two	Semester hours per week:	6
Semester:	Four	Workload:	180 h
Duration of module:	One semester	Credits:	6
Status:	Compulsory module	Assessment:	Seminar paper
Frequency:	Every second semester	Weighting for total grade:	6

Breakdown of the total workload:

On-campus studies	Excursion	Self-study	Assessment
55.5 h	12 h	112.5 h	-

Short description of the module:

In the course “Renewable Energies”, this topic that is increasing in significance is examined in detail. The students gain detailed knowledge of the various ways of generating. This includes a technical and an economic component. On this basis, estimations can be made regarding technical risks and possible further developments or potentials for increasing efficiency. Besides that, the course participants can estimate the various types of renewable energies with regard to their economic efficiency and assess chances or risks arising from the change to boundary conditions. In addition, the participants acquire an insight into technologies that are still in the early stages of development, but which may play a significant role in the future. Additionally, the relevant groups of market actors are presented and the effects of the increasing utilisation of renewable energies are examined on a scientific basis.

Combining the module with other courses and modules in the degree course:

The course builds on the “Fundamentals of Energy Management” (Module XI), the basics of “Energy Conversion Technologies” (Module XII) and on the module “Energy Market Participants” (Module XIII) and goes into more detail of the knowledge gained in them.

The foundation for “Strategic Management” (Module X) is laid at various stages. The development of renewable energy projects is then deepened in “Project Development and Management” (Module XV). Due to the chosen way of assessment (“seminar paper”), the students deepen the skills acquired in Module XXIII on scientific work and communication techniques.

Compatibility with other courses of study:

The module “Renewable Energies” covers a growing share of international primary energy supplies and thus needs to be part of the curriculum of a course of study influenced by energy management. With that, it represents a deepening of energy management knowledge regarding the market and is thus compatible with all energy management related economic sciences or (economic) engineering course of study at the university of applied sciences and all other universities.

In addition, due to the relatively little previous theoretical knowledge, it is suitable as a compulsory elective module for interested students from other courses of study.

Teaching and studying methods and techniques:

In the scope of the module “Renewable Energies”, five different didactical methods are applied depending on the educational objective. The actual lecture serves the teaching of basic factual knowledge. Practical examples and innovative concepts are conveyed by lectures by and discussion with special guest speakers or by scientific films shown in the course. Marginal and future technologies as well as current developments are usually covered in the student lectures in the scope of the assessment “Seminar paper”. A day trip with a guided tour of renewable energy plants (e.g. wind turbines, solar park, hydroelectric power plant) round off the programme.

The assessment involves a seminar paper on a topic of renewable energies chosen by the student. With regard to the scientific working, besides the actual research work for the systematic preparation of the topic, the students are always required to make their own contribution where conclusions can be made from the results of research.

Course:	Renewable Energies	Course Code
Module:	XIV Renewable Energies	EM 14.1

Head of the module:	Prof. Dr Jochen Weillepp	Lecturer:	Prof. Dr Jochen Weillepp
----------------------------	--------------------------	------------------	--------------------------

Part of studies:	Two	Semester hours per week:	6
Semester:	Four	Workload:	180 h
Status:	Compulsory subject	Credits:	6
Frequency:	Every second semester	Assessment:	Seminar paper
Taught in:	English		

Breakdown of the workload:

On-campus studies	Excursion	Self-study	Assessment
55.5 h	12 h	112.5 h	-

Prerequisites:

The basics of energy management and power plant technology as taught in the “Fundamentals of Energy Management” (Module XI) and “Energy Conversion Technologies” (Module XII).

Qualification objectives:

The knowledge acquired in “Energy Conversion Technologies” (Module XII) from the field of renewable energies are deepened and expanded in this course. The students know the different types of energy extraction from regenerative sources in great detail. They master, on the one hand, the technical basics of energy conversion, i.e. how electricity, heat and refrigeration is generated from the sun, wind etc. Furthermore, they also possess the ability to discuss economic factors such as subsidies. On the basis of the entirety of this knowledge, the students are able to draw up extensive feasibility analyses of the various types of generating energy. Even within one technology group, the course participants are able to make site-specific comparisons. In addition, the course participants are familiar with the chances and risks of the various types of renewable energy.

The students are able to present the actors on the market for renewable energies such as operators and plant constructors. Current developments are known and possible future scenarios can be elaborated. In addition, the students are able to critically question current trends in the field of renewable energies and discuss effects on other parts of the (energy) sector. After completing the course, the participants are also fundamentally familiar with technologies that are in the early stages of development.

Content of teaching:

- ❖ Technical natural sciences basics of renewable energies
- ❖ Analysis (technology, feasibility, sustainability) of the various renewable energy sources
 - Hydroelectric power
 - Wind energy (onshore, offshore and mini wind)
 - Solar power (concentrated and non-concentrated solar energy, PV and solar chimney power plants)
 - Bioenergy sources (biomass, biofluids, biogases)
 - Geothermal energy (near-surface and deep geo thermal energy)
 - Ocean energy (wave energy, tidal energy, osmosis energy and OTEC)
 - Utilisation of kinetic energy in currents
- ❖ Integration of the fluctuating energies into the power grid
- ❖ Transportation mechanisms

Lecture material:	Script online in Ilias, supplementary handouts as and when required
Recommended reading:	Bührke, T. / Wengenmayr, R.: Erneuerbare Energien, Wiley-VCH, 2012
	Quaschnig, V.: Regenerative Energiesysteme, Hanser publishing, 2013
	Quaschnig, V.: Erneuerbare Energien und Klimaschutz, Hanser publishing, 2013
	Schwabbach, T. / Wesselak, V.: Energie – Die Zukunft wird erneuerbar, Springer Vieweg, 2012
	Wesselak, V. / Voswinckel, S.: Photovoltaik – Wie Sonne zu Strom wird, Springer Vieweg, 2012