Course description

Department/Unit /	KKE / RESA			**Academic Year**	2023/2024	
Title	Renewable Energy Sources			**Type of completion**	Exam	
Accredited/Credits	Yes, 4 Cred.			**Type of completion**	Combined	
Number of hours	Lecture 1 [Hours/Week] Tutorial 2 [Hours/Week]					
Occ/max	Status A	Status B	Status C	**Course credit prior to**	YES	
Summer semester	0 / -	0 / -	0 / -	**Counted into average**	YES	
Winter semester	0 / -	0 / -	0 / -	**Min. (B+C) students**	10	
Timetable	Yes			**Repeated registration**	NO	
Language of instruction	English			**Semester taught**	Winter semester	
Optional course	Yes			**Internship duration**	0	
Evaluation scale	1|2|3|4			**Ev. sc. – cred.**	S|N	
No. of hours of on-premise						
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.					
Periodicity	K					
Substituted course	KKE/ATCA					
Preclusive courses	N/A					
Prerequisite courses	N/A					
Informally recommended courses	N/A					
Courses depending on this Course	N/A					

Course objectives:

The aim of the course is to acquaint students with technologies for the use of energy from renewable sources. Students will gain knowledge of theoretical, practical and design principles of sources with a stable production profile and intermittent sources. Students will be able to describe the principles and functioning of water, solar, wind and geothermal sources. Students will also get acquainted with technologies for the use of biomass energy, with heat pump technologies and with systems for the use of low-potential heat. Students will also be able to describe the principles of integration of renewable sources into the power system, including elements of smart grids and energy storage.

Requirements on student

Project elaboration and its defense (seminar work)
Passing the exam

Content

Lectures:
1. Introduction to renewable sources.
2. Hydro energy.
3. Water turbines and hydropower plants.
4. Solar energy.
5. Photovoltaic power plants and solar thermal power systems.
6. Wind energy.
7. Wind power plants and wind farms
8. Combustion of biomass.
9. Biogas power plant technology.
10. Geothermal energy.
11. Heat pumps.
12. Use of low-potential heat.
13. Smart Grids and Smart Regions.

14. Energy storage systems currently available.
15. Energy storage systems in the future and future development of renewable energy.
Exercises:
1. Introduction to design and modelling of renewable energy systems.
2. Design and modelling of hydropower systems.
3. Design and modelling of photovoltaic systems.
4. Design and modelling of CSP systems including thermal energy storage systems.
5. Design and modelling of wind systems.
6. Design and modelling of biomass combustion system.
7. Design and modelling of geothermal systems.

Fields of study

Guarantors and lecturers

- **Guarantors:** Ing. Lukáš Richter (100%)
- **Lecturer:** Ing. Lukáš Richter (80%)
- **Tutorial lecturer:** Ing. Lukáš Richter (20%)

Literature

- **Basic:** Hicks, Tyler Gregory. *Handbook of energy engineering calculations*. New York : McGraw-Hill, 2012. ISBN 978-0-07-174552-9.
- **Basic:** Patel, Mukund R. *Wind and solar power systems : design, analysis, and operation*. 2nd ed. Boca Raton ; CRC Press, 2006. ISBN 0-8493-1570-0.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Individual project (40)	30
Contact hours	45
Preparation for an examination (30-60)	30
Total:	**105**

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

Combined exam

Skills - skills achieved by taking this course are verified by the following means:

Project

Competences - competence achieved by taking this course are verified by the following means:

Individual presentation at a seminar

Project

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

understand the basic physical principles of transformation of various forms of energy

master the basic algebraic mathematical apparatus for the description of physical phenomena

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

solve basic systems of linear equations and basic infinitesimal calculus

work with a computer at the user level of basic office suites

Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A

N/A

N/A

teaching methods

Knowledge - the following training methods are used to achieve the required knowledge:

Lecture

Practicum

Multimedia supported teaching

Skills - the following training methods are used to achieve the required skills:

Practicum

Lecture

Individual study

Self-study of literature

Competences - the following training methods are used to achieve the required competences:

Individual study

Students' portfolio

learning outcomes

Knowledge - knowledge resulting from the course:

design, construction and operation of various renewable energy technologies

principles of integration of intermittent sources into the electricity system

Skills - skills resulting from the course:

design and modeling of various renewable resources in commercial software

Competences - competences resulting from the course:

N/A

N/A

N/A

N/A

Course is included in study programmes: