Course description

Department/Unit /	KKE / CHPA			**Academic Year**	2023/2024
Title	Combined Heat & Power			**Type of completion**	Pre-Exam Credit
Accredited/Credits	Yes, 3 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**	NO
Summer semester	0 / -	0 / -	0 / -	**Counted into average**	YES
Winter semester	0 / -	0 / -	0 / -	**Min. (B+C) students**	2
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				
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/FFMA				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

The main objectives of the Combined Heat and Power (CHP) module are:
1. understanding basic CHP terms, definitions and parameters.
2. understanding CHP as one of the most efficient ways to burn fuel.
3. understanding thermal design of CHP systems and the types of technology.

Requirements on student

Continuous assessment: fulfilment of test requirements
Final assessment: test

Content

1	Overview of Combined Heat and Power (CHP) Systems
2	Thermodynamics and performance analysis
3	Techno-economic assessment
4	Integration into energy systems & CHP benefits
5	Internal combustion & Reciprocating engines
6	Stirling engines
7	Steam turbines & Microturbines
8	ORC waste heat recovery systems
9	Fuel cell systems
10	Biomass fuels
11	Heat-activated cooling technologies
12	Energy storage
13	Applications of CHP systems & Case studies & Best practice analysis

Fields of study

Guarantors and lecturers

- **Guarantors:** Doc. Ing. Petr Eret, Ph.D. (100%)
- **Lecturer:** Doc. Ing. Petr Eret, Ph.D. (80%)
- **Tutorial lecturer:** Doc. Ing. Petr Eret, Ph.D. (20%)

Literature

- **Recommended:** Christos A. Frangopoulos. *Cogeneration: Technologies, Optimization and Implementation*. The Institution of Engineering and Technology, 2017. ISBN 9781785610554.
- **Recommended:** Paul Breeze. *Combined Heat and Power*. Academic Press, 2017. ISBN 9780128129098.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Contact hours	15
Preparation for formative assessments (2-20)	10
Preparation for comprehensive test (10-40)	20
Practical training (number of hours)	30
Total:	**75**

assessment methods

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

Test

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

Test

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

Test

prerequisite

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

1. fundamentals of thermodynamics and fluid mechanics.
2. ability of individual work and collaboration in a group.

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

computational skills in linear algebra and mathematical analysis (differential calculus).

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

N/A

teaching methods

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

Lecture

Practicum

learning outcomes

Knowledge - knowledge resulting from the course:

1. understanding the benefits of cogeneration.
2. knowledge of various CHP technologies.
3. knowledge of thermodynamics of CHP systems

Skills - skills resulting from the course:

1. performance analysis of CHP systems.
2. techno-economic assessment.

Competences - competences resulting from the course:

N/A

Course is included in study programmes: