Cracow University of Technology

Course syllabus

binding for the doctoral students of the CUT Doctoral School commencing their studies in the academic year 2022/2023

Information on the course

Name of the course in Polish	Energetyka Konwencjonalna
Name of the course in English	Conventional Heat and Power Generation
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technology
Discipline of education	Environmental engineering, ,mining and power engineering
Person responsible for the course Contact	Prof. Jan Taler, *doctor hab.*, MSc in Eng. jtaler@pk.edu.pl

Type of course, number of hours in the study programme curriculum

Semester	Credit type (G / NG)*	Lecture	Practical class	Laboratory	Computer Laboratory	Project class	Seminar
2, 3, 4, 5, 6	G	15	0	0	0	0	0

*G – graded credit, NG – non-graded credit

Course objectives

Code	Objective description
Objective 1	Introduction to Poland's energy resources and the organization of the energy system in Poland.
Objective 2	Introduction to the conservation equations of mass, momentum and energy, and their application in the calculations of water and steam boilers, steam, gas and water turbines, pumps, electric, storage and flow heaters, heat exchangers and reduction valves.
Objective 3	Introduction to design and calculations of power plants and combined heat and power plants.

Learning Outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUT SD	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows the methods of modelling thermodynamic processes in energy systems and installations	E_W01 E_W02	Involvement in class activities, presentations
EUW2	The doctoral student has the knowledge of generation of mechanical, electrical and thermal	E_W01	Involvement in class activities, presentation

	energy; knows the basic energy technologies and devices		
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to apply the mass, momentum and energy conservation equations to describe the processes that are related to the implementation of the doctoral dissertation	E_U01	Discussion, graded presentation and a written test
EUU2	The doctoral student is able to indicate the influence of the applied model on the obtained results of modelling issues related to the implementation of the doctoral dissertation.	E_U01	Discussion
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is able to refer to the methods of analysing the issues of modelling energy systems known in the literature, which are related to the implementation of the doctoral dissertation, and to justify the models they use or the lack of the need to use them.	E_K03 E_K01	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Types of power plants and classification. Distributed and prosumer energy.	EUW1, EUW2 EUU1	1
W2	The laws of conservation of the mass of momentum and energy. Examples of the use of conservation equations.	EUW1, EUU1	2
W3	Thermal cycles of condensing power plants and combined heat and power plants. Steam power plant efficiency and ways of improving it.	EUW1, EUU1	1
W4	Improving the Rankine cycle efficiency through interstage steam superheating.	EUW2, EUU2, EUU1, EUK1	1
W5	Improving the Rankine cycle efficiency through interstage steam superheating.	EUW1, EUW2, EUU2, EUK1	2
W6	Improving the Rankine cycle efficiency by regenerative heating of the feed water (carnotization of the Rankine cycle)	EUW1, EUW2, EUU2, EUK1	2
W7	Thermal systems of power plants and steam heat and power plants with sub- and supercritical pressure. Boilers, turbines and auxiliary power plant equipment.	EUW1, EUW2, EUU2, EUK1	1
W8	Nuclear power plants with pressurized and boiling reactors. Thermal systems. Comparison of the Rankine cycle in a classical and nuclear power plant	EUW1, EUW2, EUU2, EUK1	1
W9	Power plants with gas turbines and steam and gas power plants.	EUW1, EUU1	2
W10	Power plants with internal combustion engines.	EUW1, EUU1	1

W11	Improving the flexibility of heat blocks.	EUW1, EUU1, EUK1	1

The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
SCHEDULED CONTACT HOURS WITH THE ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, report, project, presentation, discussion	4
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Knowledge of technical thermodynamics, fluid mechanics and heat transfer.
2	knowledge of the English language

Course credit assignment conditions / method of the final grade calculation

No.	Description
	COURSE CREDIT ASSIGNMENT CONDITIONS
1	80% attendance in class.
2	Delivery of a paper.
	METHOD OF THE FINAL GRADE CALCULATION
	Credit assigned on the grounds of weighted average of the result of the written test and the delivery of the paper.

Additional information

None

The course reading list

1	Pawlik M., Strzelczyk F., Power plants. Fifth revised edition, WNT Warszawa 2009.
2	Sarkar D. K., Thermal Power Plant. Design and Operation, Elsevier, Amsterdam 2015
3	Spliethoff H., Power Generation from Solid Fuels. Springer, Heidelberg-Dordrecht 2010.
4	Ehrlich R., Geller H.A., Reneweble Energy. Second Edition, CRC Press, Boca Raton 2018.