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	Monitorowanie maszyn i urządzeń energetycznych
Name of the course in English	Monitoring of machines and energy devices
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. Bohdan Węglowski, *doctor hab.*, MSc in Eng. bohdan.weglowski@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 the operation principles and methods of monitoring machines and energy devices
Objective 2	Introduction to the operation of power boilers in transient and stable conditions
Objective 3	Acquiring the ability to designate critical elements of boilers and to monitor them

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 operation principles of machines and energy devices	E_W01 E_W02	Involvement in class activities, presentations
EUW2	The doctoral student knows the methods of determining the permissible operating parameters of pressure elements	E_W01 E_W02	Involvement in class activities, presentation
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to select the critical pressure elements of the boiler	E_U01	Discussion,

EUU2	The doctoral student is able to determine the permissible rates of temperature and stress changes for the monitored elements of the boiler.	E_U01	Discussion, written test
EUU3	The doctoral student is able to calculate the wear degree from creep and low-cycle failure	E_U02	Discussion, written test
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is able present and analyse the results of monitoring the work of pressure elements and justify the selection criteria	E_K03 E_K01	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Fundamentals of exploitation and theories of reliability	EKW1	1
W2	Methods of measuring temperature and pressure	EKW1	1
W3	Determining permissible operating parameters for critical pressure elements of boilers and turbines	EKW1, EKU2	3
W4	Stresses in pressure elements and methods of their monitoring. Calculations of the permissible effectiveness.	EKW1, EKW2	3
W5	Monitoring wear of pressure elements from creep and low-cycle failure	EKW1, EKW2	3
W6	Monitoring the operation of power boilers in non-stationary and steady conditions. Examples.	EKW1, EKW2	3

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 the construction of energy devices

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	

1	75 % attendance in class.
2	Delivery of a paper.
3	Written test
	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	Thermal stresses, Orłoś Zbigniew ed., Warsaw, 1991, WNT
2	Material science interpretation of steel durability for the power industry, Dobrzański J., Volume 3, 2011, Open Access Library
3	EN 12952-3, Water-tube boilers and auxiliary equipment, Part 3: Design and calculations of pressure parts, Warsaw 2004, PKN
4	Węglowski B., Block of thermal limitations of energetic steam boilers, Krakow, 2001, Publishing House of Cracow University of Technology
5	Węglowski B., Operation of power boilers in transient conditions, Krakow, 2019, Publishing House of Cracow University of Technology