

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	Analiza termiczna w badaniach materiałowych
Name of the course in English	Thermal analysis in material science.
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Choosable
Field of education	Engineering and technology
Discipline of education	Materials engineering
Person responsible for the course Contact	Marek Hebda, <i>doctor habilitatus</i> , prof. of CUT marek.hebda@pk.edu.pl

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

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

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

Course objectives

Code	Objective description
Objective 1	Expanding knowledge in the field of thermal analysis and its practical application in the analysis and interpretation of test results.
Objective 2	Acquiring the ability to select appropriate research methods depending on the type and state of the material and the implementation of these tests.

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUD DS	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows and understands the methodology of conducting modern laboratory tests of materials.	E_W01, E_W02	Involvement in class activities, a presentation
EUW2	The doctoral student knows and understands the basic structural phenomena occurring in engineering materials under the influence of energy.	E_W01, E_W02	Involvement in class activities, a presentation

OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to select appropriate methods of testing the properties of materials and correctly analyze and evaluate / classify the results obtained.	E_U01	Involvement in class activities, discussion
EUU2	The doctoral student has the ability to plan and carry out basic methods of testing engineering materials, operate specialized scientific and research equipment, and is able to collect and process test results and evaluate measurement errors.	E_U01	Involvement in class activities, discussion
EUU3	The doctoral student is able to use analytical, simulation and experimental methods to formulate and solve material problems in the technology.	E_U01	Involvement in class activities, discussion
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is able to refer to solutions and research results known in the literature using methods of thermal analysis of materials and is able to indicate solutions that can be used for issues related to the implementation of a doctoral dissertation or to justify the lack of the need to use such research methods.	E_K01	Involvement in class activities, discussion
EUK2	The doctoral student is able to apply the methods of thermal analysis to the formulation and solving of material problems in the technology.	E_K03	Involvement in class activities, discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Objectives and general principles of conducting experimental research using thermal analysis methods.	EUW1, EUU1, EUK1, EUK2	2
W2	Classification of methods according to the type of measurement feature, discussion of factors influencing the measurement, correction and calibration of measurement, devices configuration, causes of measurement errors.	EUW1, EUU1, EUK1, EUK2	2
W3	Thermogravimetry, analysis of reduction and oxidation processes, interpretation of recorded curves, examples of practical application of thermogravimetric analysis in material research.	EUW1, EUU1, EUK1, EUK2	2
W4	Differential thermal analysis and differential scanning calorimetry - research methodology, interpretation of recorded curves, examples of practical application of DTA / DSC analysis in material tests.	EUW2, EUU2, EUK1, EUK2	2
W5	Thermomechanical thermal analysis - research methodology, interpretation of recorded curves, examples of practical application of TMA and DMA analysis in material tests.	EUW2, EUU2, EUK1, EUK2	2

W6	Discussion of issues related to coupled methods, analysis of gaseous products emitted from materials, the possibility of determining the change in density as a function of temperature and thermoporosimetric measurements.	EUW2, EUU2, EUK1, EUK2	2
W7	Identification of the possibility of using thermal analysis methods in issues related to the subject of ongoing doctoral dissertations.	EUW2, EUU2, EUU3, EUK1, EUK2	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 AN ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Examination / course credit assignment	1
HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, a report, a project, a presentation, a discussion	5
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Not specified

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	75% attendance in class.
2	Presentation of a paper.
METHOD OF THE FINAL GRADE CALCULATION	
Assessment of the presented paper, taking into account the attendance.	

Additional information

Not specified

The course reading list

1	Paul Gabbott — Principles and application of thermal analysis, 2008, Blackwell Publishing Ltd
2	Detrich Schultze — Termiczna analiza różnicowa, Warszawa, Wydawnictwo PWN
3	Michio Sorai, Nihon Netsusokutei Gakkai - Comprehensive handbook of calorimetry and thermal analysis, 2004, J. Wiley
4	W. Zielenkiewicz - Pomiary efektów cieplnych - metody i zastosowania, Warszawa, 2000, Centrum Upowszechniania Nauki PAN

5	Handbook of Thermal Analysis and Calorimetry: Recent Advances, Techniques and Applications, 2018, Elsevier
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