

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	Planowanie doświadczeń
Name of the course in English	Design of experiments
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Choosable
Field of education	Engineering and technology
Discipline of education	Mechanical engineering
Person responsible for the course Contact	Jacek Pietraszek, <i>doctor habilitatus</i> , prof. of CUT jacek.pietraszek@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	Introduction to the methods of planning and conducting active experiments.
Objective 2	Introduction to the methods of analysis of experimental data identifying the influence of controlled factors on the observed value.
Objective 3	Acquiring the ability to design and conduct an active experiment and then analyze the obtained data in order to obtain a prognostic model of the analyzed phenomenon.

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 the methods of designing and conducting active experiments.	E_W01, E_W02	Involvement in class activities. A presentation.
EUW2	The doctoral student knows the methods of analyzing the experimental data identifying the influence of the controlled factors on the observed value.	E_W01, E_W02	Involvement in class activities. A presentation.

OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to choose the experimental plan, the type of prognostic model and the way of conducting the experiment for the analyzed phenomenon.	E_U01	A presentation, discussion.
EUU2	The doctoral student is able to analyze the obtained experimental data in order to identify the influence of the controlled factors on the observed value.	E_U01	A presentation, discussion.
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is able to refer to the methods of planning experiments and analyzing experimental data related to the implementation of a doctoral dissertation known in the subject literature and to justify the models they use or the lack of the need to use them.	E_K01, E_K03	Discussion.

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
WYKŁAD			
W1	Literature of the subject. Descriptive statistics. Point estimation. Interval estimation.	EUW2, EUU2	2
W2	Initial data analysis. Stevens measurement scales. Box-Cox transformation.	EUW2, EUU2	2
W3	Analysis of variance. Generalized linear models.	EUW2, EUU2	2
W4	Complete factorial plans. Fractional factorial designs. Selection of dominant controlled factors.	EUW1, EUU1, EUK1	2
W5	Latin squares. Taguchi method (Robust Design).	EUW1, EUU1, EUK1	2
W6	Response Surface Plans (RSM). Plans for mixtures.	EUW1, EUU1, EUK1	3
W7	Optimal plans. Linear discriminant analysis. Dimensionality reduction: Principal Component Analysis (PCA) and Cluster Analysis (CA).	EUW2, EUU2	2

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	0
HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER	
Independent study of the course contents	9
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	Mathematics in the field of engineering.
2	Knowledge of the English language.

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	66% attendance in class.
2	Presentation of a paper.
METHOD OF THE FINAL GRADE CALCULATION	
Course credit and the final grade assigned on the grounds of the paper's presentation and discussion.	

Additional information

The thematic scope of the lecture, including the level of advancement of the presented theories and modelling examples, takes into account the scope of knowledge in the subject matter acquired by doctoral students at earlier stages of education.

The course reading list

1	Montgomery D.C., <i>Design and analysis of experiments</i> , Hoboken, 2008, Wiley.
2	Ryan T.P., <i>Modern Experimental Design</i> , Hoboken, 2007, Wiley.
3.	John P.W.M., <i>Statistical Design and Analysis of Experiments</i> , Philadelphia, 1998, SIAM.
4.	Everitt B.S., Landau S., Leese M., Stahl D., <i>Cluster Analysis</i> , Hoboken, 2011, Wiley.
5.	Izenman A.J., <i>Modern Multivariate Statistical Techniques. Regression, Classification, and Manifold Learning</i> , 2008, Springer.