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	Statystyka w Badaniach Eksperymentalnych
Name of the course in English	Statistics in Experimental Studies
Number of the ECTS points	2
Language of instruction	Polish
Category of the course	Compulsory
Field of education	Engineering and Technology
Discipline of education	Civil Engineering and Transport
Person responsible for the course Contact	CUT Prof. Vitalii Naumov PhD Eng. vitalii.naumov@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	15	0	0

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

Course objectives

Code	Objective description
Objective 1	Expanding knowledge in the field of experimental statistics
Objective 2	Acquiring the ability to use modern tools for statistical analysis

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	A PhD student has knowledge of the application of statistical methods in experimental research in transport issues	E_W02, E_W03	A final task
	OUTCOMES RELATED TO SKILLS		
EUU1	A PhD student is able to adjust the methodology of statistical analyses to the needs of the conducted research	E_U02	A laboratory exercise
EUU2	A PhD student knows how to use statistical tools to support inference in transport issues	E_U02	A laboratory exercise

	OUTCOMES RELATED TO SOCIAL COMPETENCES		
EUK1	A PhD student is ready to critically evaluate the results of statistical analysis in experimental research	E_K01	A discussion in class

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
	LECTURE		
W1	Basic concepts and issues of statistics in experimental research. Basic measures of a random variable	EUW1, EUK1	2
W2	Basics of Python as a tool for performing statistical analysis	EUW1, EUU1, EUU2	3
W3	Basic distributions of random variables. Distributions of discrete variables. Distributions of continuous variables	EUW1, EUU1, , EUU2, EUK1	3
W4	Testing hypotheses about the distribution of a random variable. Pearson's chi-square criterion. Kolmogorov-Smirnow criterion	EUW1, EUU1, EUU2, EUK1	2
W5	Basics of correlation analysis	EUW1, EUU1, EUU2, EUK1	2
W6	Regression analysis. Multiple linear regression. Significance test for regression coefficients	EUW1, EUU1, EUU2, EUK1	3

No.	Contents	Learning outcomes for the course	No. of hours
	COMPUTER LAB		
K1	Characterization of a random variable	EUU1, EUU2, EUK1	2
K2	Estimating parameters of random variables	EUU1, EUU2, EUK1	2
K3	Python statistical data analysis	EUU1, EUU2, EUK1	2
K4	Pearson's chi-square compatibility test	EUU1, EUU2, EUK1	2
K5	Kolmogorov-Smirnov compliance test	EUU1, EUU2, EUK1	2
K6	Estimation of correlation coefficients	EUU1, EUU2, EUK1	2
K7	Estimation of multiple regression coefficients	EUU1, EUU2, EUK1	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	30
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER	
Independent study of the course contents	12
Preparation of a final task	15
ECTS POINTS STATEMENT	

Total number of hours	60
The ECTS points number	2

Preliminary requirements

No.	Requirements
1	Knowledge of the basics of higher mathematics
2	Knowledge of the basics of programming

Course credit assignment conditions / method of the final grade calculation

No.	Description
	COURSE CREDIT ASSIGNMENT CONDITIONS
1	80% attendance in class. Completion of a final task
	METHOD OF THE FINAL GRADE CALCULATION
	Assessment of the final task, taking into account the presence

Additional information

Not specified

The course reading list

1	Nawidi, W. *Statistics for Engineers and Scientists*, 2004, McGrow Hill
2	Madsen, B.S. *Statistics for Non-Statisticians*, 2016, Springer
3	Forbes, C., Evans, M., Hastings, N., Peacock, B. *Statistical distributions*, 2011, Wiley & Sons Inc.
4	Downey, A.B. *Think Python: How to Think Like a Computer Scientist*, 2015, O'Reilly
5	Garreta R., Moncecchi G. *Learning scikit-learn: Machine Learning in Python*, 2013, Packt
6	Raschka, S., Mirjalili, V. *Python Machine Learning*, 2017, Packt