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	Matematyka z elementami statystyki
Name of the course in English	Applied mathematics and statistics
Number of the ECTS points	2
Language of instruction	Polish
Category of the course	Mandatory
Field of education	Engineering and Technology
Discipline of education	Environmental engineering, ,mining and power engineering
Person responsible for the course Contact	Paweł S. Hachaj, *doctor hab.*, MSc in Eng. pawel.hachaj@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	G	15	15	0	0	0	0

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

Course objectives

Code	Objective description
Objective 1	Introduction to applied mathematics as a tool and language of natural and technical sciences.
Objective 2	Gaining knowledge of the basics of selected branches of applied mathematics, in particular elements of the probability theory and statistics.

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 understands the approach to applied mathematics as the language of natural and technical sciences; knows the possibilities and limitations of the scientific method	E_W01 E_W02 E_W05	Involvement in class activities
EUW2	The doctoral student knows the basics of selected areas of applied mathematics, in particular: graph theory, optimization, harmonic analysis, solving differential equations	E_W01	Involvement in class activities
EUW3	The doctoral student knows the basics of probability theory and statistics	E_W01	Involvement in class activities
OUTCOMES RELATED TO SKILLS			

EUU1	The doctoral student is able to apply their knowledge of applied mathematics to real engineering problems, in particular regarding the subject of their doctoral dissertation	E_U01	Involvement in class activities
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student understands the difference between formal and everyday reasoning; in practical situations, is able to make transitions between them for the benefit of interlocutors (formalization and popularization)	E_K01 E_K03 E_K05	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE/ PRACTICAL CLASS			
W1	Mathematics as the language of science	EUW1, EUU1, EUK1	3L 2PC
W2	Fundamentals of graph theory	EUW2, EUU1, EUK1	3L 3PC
W3	Outline of the theory of probability and statistics	EUW3, EUU2 EUK1	3L 3PC
W4	Ranking and optimization	EUW1, EUU1, EUK1	2L 3PC
W5	Harmonic analysis	EUW1, EUU1, EUK1	2L 2PC
W6	Fundamentals of the application of differential equations in engineering problems	EUW1, EUU1, EUK1	2L 2PC

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	30
Consultations	2
Examination / course credit assignment	1
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	15
Preparation of a paper, report, project, presentation, discussion	12
ECTS POINTS STATEMENT	
Total number of hours	60
The ECTS points number	2

Preliminary requirements

No.	Requirements
1	Knowledge of applied mathematics adequate for a graduate of science and / or technical studies

Course credit assignment conditions / method of the final grade calculation

No.	Description
	COURSE CREDIT ASSIGNMENT CONDITIONS
1	Minimum 75% attendance in class.
2	Involvement in class activities
	METHOD OF THE FINAL GRADE CALCULATION
	Credit assigned on the grounds of attendance in class and involvement in class activities

Additional information

Assumption of the course: currently existing programs of applied mathematics seem to attach too much importance to detailed methods of mathematical analysis and linear algebra, which in the age of computerization are becoming less and less useful for practitioners, and whose descriptions are readily available if necessary. Instead of the above, the proposed course syllabus focuses on the issues at the interface: {physical problem → mathematical model} and {calculation result → practical conclusion}.

The course reading list

1	J. Robertson, S. Robertson: "Full System Analysis"
2	R. Penrose: "The Emperor's New Mind"
3	J. Churgin: "And what next?"
4	E.M. Goldratt "Objective II: It's not a coincidence"
5	N.N. Taleb: "Seduced by Randomness"
6	W. Kurt: "Bayesian statistics - the fun way"
7	D. Sumpter: "Outnumbered"