

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	Modelowanie i analiza układów dynamicznych z wykorzystaniem stochastycznych metod hybrydowych
Name of the course in English	Modelling and analysis of dynamic systems by using stochastic hybrid methods
Number of the ECTS points	1
Language of instruction	Polish/English
Category of the course	Choosable
Field of education	Engineering and Technology
Discipline of education	Civil Engineering and Transport
Person responsible for the course Contact	CUT Prof. Piotr Koziol PhD Eng. piotr.koziol@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	NG	15	0	0	0	0	0

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

**Course objectives**

Code	Objective description
Objective 1	Expanding knowledge about random properties of dynamical systems and methods of their analysis using hybrid methods supported by heuristic techniques.

**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 knows the basic tools of stochastic analysis in dynamics.	E_W01, E_W02, E_W03	Involvement in class activities, a paper
EUW2	A PhD student knows and understands the principles of modelling random phenomena in dynamics, using heuristic hybrid methods..	E_W01, E_W02, E_W03	Involvement in class activities, a paper
OUTCOMES RELATED TO SKILLS			

EUU1	A PhD student is able to identify random phenomena in the studied systems and propose an appropriate method of their modelling / analysis.	E_U01	A paper
<b>OUTCOMES RELATED TO SOCIAL COMPETENCES</b>			
EUK1	A PhD student recognizes the importance of knowledge in solving cognitive and practical problems related to random phenomena in complex dynamical systems	E_K03	A discussion

#### Course outline

No.	Contents	Learning outcomes for the course	No. of hours
<b>LECTURE</b>			
W1	Heuristic methods in scientific research.	EUW1, EUW2,	2
W2	Hybrid methods in modelling dynamical systems.	EUW1	2
W3	Basic concepts of stochastic analysis (stochastic functions and their characteristics).	EUW1	4
W4	Examples of applications of stochastic analysis in the study of dynamical systems (dynamics of structures, BRD analysis and others).	EUW1, EUU1, EUK1	7

#### The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
<b>SCHEDULED CONTACT HOURS WITH AN ACADEMIC TEACHER</b>	
Hours allotted in the syllabus	15
Consultations	2
Examination / course credit assignment	0
<b>HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER</b>	
Independent study of the course contents	8
Preparation of a paper, a report, a project, a presentation, a discussion	5
<b>ECTS POINTS STATEMENT</b>	
Total number of hours	30
The ECTS points number	1

#### Preliminary requirements

No.	Requirements
1	Knowledge of the basics of differential calculus.
2	Knowledge of the basics of theory of probability.

#### Course credit assignment conditions / method of the final grade calculation

No.	Description
<b>COURSE CREDIT ASSIGNMENT CONDITIONS</b>	

1	80% attendance in class. A paper presentation.
METHOD OF THE FINAL GRADE CALCULATION	
Completion of the pass conditions	

**Additional information**

Not specified
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**The course reading list**

1	Sobczyk K., Stochastyczne równania różniczkowe, WNT, 1996, Warszawa.
2	Sobczyk K., Fale stochastyczne, PWN, 1982, Warszawa.
3	Koziol P., Wavelet approach for the vibratory analysis of beam-soil structures: Vibrations of dynamically loaded systems, VDM Verlag Dr. Müller, 2010, Saarbrücken.
4	Scientific journals.
5	Conference materials.