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	Zorientowane Obiektowo Modele Systemów Transportowych i Logistycznych
Name of the course in English	Object-oriented models of transport and logistics systems
Number of the ECTS points	2
Language of instruction	Polish
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 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 system modelling
Objective 2	Acquiring the ability to use modern computer simulation tools

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 The doctoral student has knowledge of the application of the object-oriented paradigm in the development of models of transport and logistics systems	E_W02, E_W03	Final task
OUTCOMES RELATED TO SKILLS			
EUU1	A PhD student is able to create an object-oriented model of a transport or logistics system	E_U02	A laboratory exercise

EUU2	A PhD student knows how to design classes and implement code for simulation models	E_U02	A laboratory exercise
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	A PhD student is ready to critically evaluate the results of computer simulations	E_K01	A discussion during classes

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Systems approach in designing object-oriented models of transport and logistics systems	EUW1, EUK1	2
W2	Basic assumptions of the object-oriented paradigm: abstraction, encapsulation, polymorphism, inheritance	EUW1, EUU1, EUU2	3
W3	Basics of creating classes in Python. Basics of the UML language. Models of systems as classes	EUW1, EUU1, , EUU2, EUK1	6
W4	Simulation experiments based on object-oriented models of transport and logistics systems	EUW1, EUU1, , EUU2, EUK1	2
W5	Development of computer simulation results in Python. Python specialized libraries	EUW1, EUU1, , EUU2, EUK1	2
COMPUTER LAB			
K1	Development of models of transport and logistics systems as cybernetic models	EUU1, EUU2, EUK1	2
K2	Designing object-oriented models of transport and logistics systems	EUU1, EUU2, EUK1	2
K3	Development of the simplest logistic chain model using Python	EUU1, EUU2, EUK1	2
K4	Development of a logistic chain model as a Python class	EUU1, EUU2, EUK1	2
K5	Development of a logistic chain model as a Python class	EUU1, EUU2, EUK1	2
K6	Creation of specialized classes for the automation of simulation experiments	EUU1, EUU2, EUK1	2
K7	Regression analysis of logistic chain simulation results	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 mathematical statistics
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 attendance	

Additional information

Not specified

The course reading list

1	Bruegge, B., Dutoit, A.H., *Inżynieria Oprogramowania w Ujęciu Obiektowym: UML, Wzorce Projektowe i JAVA*, 2011, Helion
2	Grus, J., Data Science From Scratch: First Principles with Python, 2015, O'Reilly
3	Cellier, F.E., *Continuous System Simulation*, 2006, Springer Science
4	Banks, J., *Discrete-event System Simulation*, 2001, Prentice-Hall
5	Downey, A.B. *Think Python: How to Think Like a Computer Scientist*, 2015, O'Reilly
6	Lutz, M., *Python: Wprowadzenie*, 2011, Helion