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	Sieci neuronowe w identyfikacji i modelowaniu układów dynamicznych
Name of the course in English	Neural networks in identification and modelling of dynamic systems
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technology
Discipline of education	Automatic Control, Electronics and Electrical Engineering
Person responsible for the course Contact	Robert Sałat, *doctor habilitatus* in Engineering, prof. of CUT robert.salat@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, 3, 4, 5	G	6	0	9	0	0	0

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

Course objectives

Code	Objective description
Objective 1	Introduction to the problems of artificial neural networks in identification and classification
Objective 2	Presentation of selected methods incorporating neural networks in modelling and identification of dynamic systems

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUT DS	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows and understands the theoretical foundations of selected neural networks	E_W01 E_W02	Attendance in class, written assessment
EUW2	The doctoral student knows and understands selected methods for identifying dynamic systems	E_W01 E_W02	Attendance in class, written assessment
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to incorporate the use of artificial neural networks into identification and modelling	E_U01	A laboratory project

OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is prepared to critically evaluate the ways of incorporating artificial networks into identification, as presented in the literature, and to emphasize the significance of knowledge in scientific research	E_K01 E_K03	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Sigmoid MLP neural networks in identification	EUW1	2
W2	SVR networks in identification	EUW2	2
W3	Selected black-box identification methods	EUW1, EUW2	2
LABORATORY			
L1	Testing MLP networks in regression	EUW1, EUW2, EUU1, EUK1	3
L2	SVM networks in identification using the NARX method	EUW1, EUW2, EUU1, EUK1	3
L3	Identification and modelling of a selected dynamic system using NARX-SVM or NARX-MLP	EUW1, EUW2, EUU1, 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 THE ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	6
Preparation of a paper, report, project, presentation, discussion	6
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Knowledge of MATLAB / Simulink
2	

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	Attendance in class, completion of a project covering the scope of the lecture and the laboratory.

METHOD OF THE FINAL GRADE CALCULATION
The final grade obtained on the project

Additional information

None

The course reading list

1	S. Osowski, *Sieci neuronowe do przetwarzania informacji*, Oficyna Wydawnicza PW, Warszawa, 2006
2	R. Klempka, A Stankiewicz, *Modelowanie i symulacja układów dynamicznych*, Wydawnictwa AGH, Kraków, 2006