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	Metody obliczeniowe w inżynierii chemicznej
Name of the course in English	Computational methods in chemical engineering
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technolgy
Discipline of education	Chemical Engineering
Person responsible for the course Contact	Robert Grzywacz, *doctus habilitatus*, DSc, prof. of CUT robert.grzywacz@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	15	0	0	0	0	0

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

Course objectives

Code	Objective description
Objective 1	To acquire and expand knowledge of computational methods applicable to the solution of typical chemical engineering problems.
Objective 2	To acquire knowledge on the possibility of using the Matlab package to solve typical computational problems in chemical engineering.
Objective 3	To acquire knowledge of advanced computational problems in chemical engineering.

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 knows and understands the classical computational methods used to solve typical computational problems in chemical engineering.	E_W01, E_W03	Involvement in class activities; discussion

EUW2	The doctoral student knows and understands advanced computational methods used to solve computational problems in chemical engineering.	E_W01, E_W02	Involvement in class activities; discussion
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to apply the acquired knowledge to perform typical numerical calculations common in chemical engineering.	E_U01, E_U10, E_U11	Involvement in class activities; a presentation
EUU2	The doctoral student is able to select a numerical method to solve computational problems in chemical engineering.	E_U01, E_U02, E_U07	Involvement in class activities; discussion
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is prepared to critically evaluate the applied methods and analyse the obtained results.	E_K01, E_K02, E_K03	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Problems of computational methods in chemical engineering, mathematical basis of computational methods.	EUW1, EUW2, EUU1, EUU2, EUK1	1
W2	The Matlab package - its application, operation and programming language.	EUW1, EUW2, EUU1, EUU2, EUK1	4
W3	Approximation and interpolation in the analysis of experimental data.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W4	Numerical solution of systems of nonlinear algebraic equations in steady-state analysis.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W5	Numerical methods for solving systems of ordinary differential equations in the analysis of object dynamics.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W6	Optimisation methods in chemical engineering.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W7	Presentation of the Ansys package for CFD calculations.	EUW1, EUW2, EUU1, EUU2, EUK1	2

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	1
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, report, project, presentation, discussion	5

ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	None

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	80% attendance in class.
2	Presentation of the calculations made.
METHOD OF THE FINAL GRADE CALCULATION	
The grade includes the evaluation of the presented work and attendance.	

Additional information

None

The course reading list

1	Fortuna Z., Macukow B., Wąsowski J., *Metody numeryczne*, Warszawa, 2016, WNT.
2	Yeong Koo Yeo, *Chemical engineering computation in Matlab*, Boca Raton, 2017, CRC Press.
3	Martin M. M., *Introduction to Software for Chemical Engineers*, Boca Raton, 2020, CRC Press.
4	Huettner M., *Metody numeryczne w typowych problemach inżynierii procesowej*, Warszawa, 1999, OWPW.
5	Ciesielczyk W., Kupiec K., *Chemical Engineering Calculations I, II, III, IV*, Kraków, 2012, WPK.
6	Pakowski Z., Adamski R., *Podstawy MATLABa w inżynierii procesowej*, 2014, WPŁ.