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	Podstawy optymalizacji
Name of the course in English	Basics of Optimization
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Compulsory / Choosable
Field of education	Engineering and Technology
Discipline of education	Civil Engineering and Transport / All disciplines
Person responsible for the course Contact	Prof. Leszek Mikulski PhD Eng. mikul@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
3	G	15	0	0	0	0	0

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

Course objectives

Code	Objective description
Objective 1	Basics of the theory of optimal control, in a form that enables practical applications
Objective 2	Principles of formulating the problems of optimal shaping of structural elements and systems and methods of their numerical solution

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 and understands the properties of concrete in complex loading conditions	E_W01, E_W02	Involvement in class activities
EUW2			
OUTCOMES RELATED TO SKILLS			
EUU1		E_U01	A paper, a presentation
EUU2		E_U01, E_U02	Involvement in class activities, a written assignment

OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1		E_K01, E_K03	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
		LECTURE	
W1	Optimum control - numerical variant	EUW1, EUW2, EUU1	4
W2	Necessary conditions for the problems of optimal shaping and control.	EUW1, EUW2	4
W3	Numerical formulation of optimization problems.	EUW2, EUU2, EUK1	3
W4	Examples of optimal shaping and control	EUW2, EUU2,EUK1	4

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	15
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, a report, a project, a presentation, a discussion	4
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Knowledge of the basics of differential and variational calculus
2	Knowledge of the English or German language

Course credit assignment conditions / method of the final grade calculation

No.	Description
	COURSE CREDIT ASSIGNMENT CONDITIONS
1	80% attendance in class. Presentation of the solution of optimization problems.
	METHOD OF THE FINAL GRADE CALCULATION
	Evaluation of a numerical solution of two strength optimization tasks.

Additional information

Not specified

The course reading list

1	Oskar von Stryk, User's Guide for DIRCOL (A Direct Collocation Method for the Numerical Solution of Optimal Control Problems) TU Darmstadt, 2002.
2	Benoit C. Chachuat, Nonlinear and Dynamik Optimization . From Theory to Practice. Laboratoire d'Automatikque, Ecole Polytechnique Federale de Lausanne. 2006.
3	Leszek Mikulski, Teoria sterowania w problemach optymalizacji konstrukcji i systemów. Kraków 2007, ISBN 978-83-7242-440-2.