

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	Dynamika układów materialnych
Name of the course in English	Dynamics of material systems
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Choosable
Field of education	Engineering and technology
Discipline of education	Mechanical engineering
Person responsible for the course Contact	Prof. Marek S. Koziń, <i>doctor habilitatus</i> marek.kozien@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	0	0	0

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

### Course objectives

Code	Objective description
Objective 1	Introduction to the methods of formulating equations of motion of material systems and methods of solving them.
Objective 2	Introduction to the causes, description, effects and methods of reducing vibrations of mechanical systems.
Objective 3	Acquiring the ability to identify the type of vibrations that may occur in the analyzed phenomenon.

### Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUD DS	Methods of verification
<b>OUTCOMES RELATED TO KNOWLEDGE</b>			
EUW1	The doctoral student knows the methods of modelling the dynamics of material systems.	E_W01, E_W02	Involvement in class activities, a presentation
EUW2	The doctoral student knows the sources of mechanical vibrations and their effects on the structure.	E_W01	Involvement in class activities, a presentation
<b>OUTCOMES RELATED TO SKILLS</b>			

EUU1	The doctoral student is able to identify dynamic mechanical phenomena that occur or may occur in an issue related to the implementation of the doctoral dissertation. The doctoral student is able to propose a method of their modelling.	E_U01	A presentation, discussion.
EUU2	The doctoral student is able to present the side effects of dynamic mechanical phenomena that occur or may occur in an issue related to the implementation of the doctoral dissertation.	E_U01	Discussion.
<b>OUTCOMES RELATED TO SOCIAL COMPETENCES</b>			
EUK1	The doctoral student can refer to the methods of analyzing the dynamics of material systems known in the subject literature and occurring in the issue related to the implementation of the doctoral dissertation. The student is able to justify the models they use or the lack of the need to use them.	E_K01, E_K03	Discussion.

### Course outline

No.	Contents	Learning outcomes for the course	No. of hours
<b>LECTURE</b>			
W1	The concept of time and space. Curvilinear coordinate systems. The geometry of the masses.	EKW1	1
W2	Newton's equation. Lagrange's equations of the second kind.	EKW1	1
W3	Equations of motion of a material point and a rigid body.	EKW1	1
W4	The phenomenon of vibrations. Deterministic and random vibrations. Chaotic vibrations.	EKW1, EKW2	1
W5	Vibrations of a system with one and two degrees of freedom. Vibrations of continuous systems on the example of a beam. Forms and frequencies of natural vibrations. Natural and forced vibrations. Transient and steady vibrations.	EKW1, EKW2	3
W6	Balancing rotating parts. Critical speed of shafts.	EKW1, EKW2	2
W7	Vibration reduction methods. Vibroisolation. The influence of vibrations on the human body.	EKW1	1
W8	Identifying the possibility of vibration occurrence in systems related to the subject of the doctoral dissertations.	EKW2, EKU1, EKU2, EKK1	5

### The ECTS points statement

WORKING HOURS SETTLEMENT	
Average number of hours (45 min.) dedicated to the completion of an activity type	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	1
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	6
<b>ECTS POINTS STATEMENT</b>	
Total number of hours	30
The ECTS points number	1

### Preliminary requirements

No.	Requirements
1	Knowledge of differential and integral calculus.
2	Knowledge of the English language.

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

No.	Description
<b>COURSE CREDIT ASSIGNMENT CONDITIONS</b>	
1	75% attendance in class.
2	Presentation of a paper.
<b>METHOD OF THE FINAL GRADE CALCULATION</b>	
Assessment of the presented paper and the discussion.	

### Additional information

<p>The thematic scope of the lecture, including the level of advancement of the presented theories, models and examples of modelling and numerical analysis, takes into account the scope of knowledge in the subject matter acquired by doctoral students at earlier stages of education.</p>
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### The course reading list

1	Nizioł J., <i>Podstawy drgań w maszynach</i> , Kraków, 1996, Wydawnictwo Politechniki Krakowskiej.
2	Leyko J., <i>Mechanika ogólna Tom 2 Dynamika</i> , Warszawa, 2022, Wydawnictwo Naukowe PWN.
3	Osiński J., <i>Teoria drgań</i> , Warszawa, 1980, PWN.