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	Teoria plastyczności i reologia
Name of the course in English	Theory of plasticity and rheology
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Modular
Field of education	Engineering and Technology
Discipline of education	Civil Engineering and Transport
Person responsible for the course Contact	Prof. Artur Ganczarski PhD Eng. artur.ganczarski@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	Expanding knowledge in the field of advanced models of materials with elastic, sticky and plastic properties
Objective 2	Acquiring skills related to matrix formulation and solving problems of plasticity theory and rheology

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 the theoretical foundations as well as general issues and selected specific issues of plasticity theory and rheology	E_W01	Involvement in the class activities, an assessment of a test or a project
EUW2	A PhD student knows the main development trends in plasticity theory and rheology	E_W02	Involvement in the class activities, an assessment of a test or a project
OUTCOMES RELATED TO SKILLS			

EUU1	A PhD student is able to make a critical analysis and evaluation of scientific research results	E_U02	Involvement in the class activities, an assessment of a test or a project
EUU2	A PhD student can participate in the scientific discourse	E_U07	Involvement in the class activities, an assessment of a test or a project
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	A PhD student is ready to critically assess the achievements in the field of plasticity and rheology	E_K01	Involvement in the class activities, an assessment of a test or a project

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Models of deformable bodies (elastic, plastic, rheological)	EUW1, EUW2, EUU1, EUU2, EUK1	2
W2	Physical equations of the theory of linear viscoelasticity of isotropic and orthotropic materials and the general case of anisotropy.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W3	Boltzmann superposition principle, integral notation of linearly viscoelastic equations and the Alfrey-Hoff analogy	EUW1, EUW2, EUU1, EUU2, EUK1	2
W4	The criteria of the perfect plasticity of materials. Basic theorems and equations of ideal plasticity.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W5	Basic analytical and numerical methods in solving problems of plasticity theory.	EUW1, EUW2, EUU1, EUU2, EUK1	2
W6	Equations of state and evolution equations for plastic strengthened materials: isotropic, kinematic and mixed reinforcement hypotheses for isotropic materials, anisotropic materials, constitutive equations of plastic strengthened materials, deformation theories, incremental theories, associative or non-associative laws.	EUW1, EUW2, EUU1, EUU2, EUK1	3
W7	Matrix formulations of incremental plasticity theory, structure of constitutive matrix, examples of applications.	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 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 strength of materials.
2	Knowledge of the theory of elasticity.

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	75% attendance in class.
2	Passing a test or completing a project.
METHOD OF THE FINAL GRADE CALCULATION	
Assessment of the test (or project)	

Additional information

Not specified

The course reading list

1	Owen D.R.J., Hinton E., *Finite elements in plasticity, theory and practice*, 1980, Pineridge Press.
2	Chen W.F, Han D.J., *Plasticity for structural engineers*, 1995, Springer Berlin.
3	Ganczarski A., Skrzypek J., *Plastyczność materiałów inżynierskich, podstawy, modele, metody i zastosowania komputerowe*, 2009, Drukarnia PK.
4	Ganczarski A., Skrzypek J., *Mechanika nowoczesnych materiałów*, 2013, Drukarnia PK.
5	Skrzypek J., Ganczarski A., *Mechanics of anisotropic materials*, 2015, Springer Verlag.