POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design and simulation of contemporary materials [S1IBio1>PiSWM_1]

Course

Field of study
Biomedical Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Robert Roszak
robert.roszak@put.poznan.pl

Lecturers

Prerequisites

KNOWLEDGE: the student has basic general knowledge about the construction of the surrounding world and the laws that govern it SKILLS: the student is able to integrate the obtained information, interpret it, draw conclusions, formulate and justify opinions SOCIAL COMPETENCES: the student is aware of the importance of designing new materials

Course objective

Construction and modeling of materials in CAx systems. Nonlinear and anisotropic models. Models elasto-viscoplastic. Models for composites. Cooperation of experimental data with numerical systems such as Abaqus, Ansys. Computer simulation with the use of computational damage models. Composite structure calculations.

Course-related learning outcomes

Knowledge:
Has an ordered, theoretically founded knowledge of the strength of materials in the field of: methods of determining external and internal forces and moments, basic attempts to determine the mechanical properties of materials, including printed materials, determining stresses and displacements. solid and

surface modeling processHas ordered, theoretically founded general knowledge of technology, systems in the process of solid and surface modeling
Has a basic knowledge of information technology and computer science in the field of the basics of computer hardware and software in the processes of processing, transmitting, presenting and securing information. He has knowledge of computer-aided engineering systems in mechanics, mechanical engineering and technology, in particular CAx engineering computer systems in product design and improvement and in preparing the product for production. Is able to design elements of machine parts with the use of additive manufacturing techniques (3D modeling, finite element method, 3D printing).
Has a basic knowledge of applied mechanics.Has a basic knowledge of applied mechanics.

Skills:
Can obtain information from literature, databases and other properly selected sources (also in English or another foreign language recognized as the language of international communication) in the field of mechanics and machine construction as well as other engineering and technical issues consistent with the field of study; is able to integrate the obtained information, interpret it, as well as draw conclusions and formulate and justify opinions.
Can prepare documentation on the implementation of an engineering task in the field of mechanics and machine construction (construction, technology, organization) and prepare a text containing an overview of the results of this task.

Social competences:
Is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made.
Can interact and work in a group, assuming different roles in it.
Is able to properly define priorities for the implementation of a task set by himself or others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired in the laboratory is verified by at least two pre-announced tests and unexpected short tests. Each of the tests consists of 2 parts - theoretical and practical, with different points. Passing threshold: 60% of points..

Programme content

Introduction to Design principles using Abaqus, Ansys, NX systems. Strength numerical analysis with nonlinear material models. Calculations taking into account the plastic ranges of materials. Use of multi-parameter models in advanced structure calculations. Analysis of structural failure processes. Interpretation and processing of experimental results. Determining parameters for calculations and validation of numerical calculations with the results of the experiment.

Course topics

none

Teaching methods

1. Lecture with multimedia presentation
2. Laboratory - problem solving

Bibliography

Basic:
1. McConnell Steve, Szybkie projektowanie. Zapanuj nad chaosem zadań i presją czasu, Helion 2017
2. Oczoś K.E.: Kształtowanie materiałów skoncentrowanymi strumieniami energii, Wyd. Pol. Rzeszowskiej, Rzeszów 1988.
3. Chlebus E.: Techniki komputerowe CAx w inżynierii produkcji, WNT Warszawa 2000.
4. Olszewski H, LABORATORIUM SZYBKIEGO PROTOTYPOWANIA : Inżynieria odwrotna. Elbląg 2012
5. Skrzypek J, Innovative Technological Materials, Springer-Verlag, 2014

Additional:

1. Kamrani K., Abouel E., Rapid Prototyping, Springer 2006.
2. Leong K., Lim Ch. Rapid Prototyping: Principles and Applications (3rd Edition), 2010.
3. D. Schob, I. Sagradov, R. Roszak, H. Sparr, R. Franke, M. Ziegenhorn et al., Experimental determination and numerical simulation of material and damage behaviour of 3D printed polyamide 12 under dynamic loading, Engineering Fracture Mechanics 2019 (2019)

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00