COURSE DESCRIPTION CARD - SYLLABUS

Course name
Simulations of loss-free product manufacturing processes [N2ZiIP2>SBPWW]

Course

Field of study
Management and Production Engineering

Year/Semester
2/3

Area of study (specialization)
Quality Engineering and Management

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
0

Laboratory classes
0

Other (e.g. online)
0

Tutorials
8

Projects/seminars
8

Number of credit points

2,00

Coordinators

dr hab. inż. Paweł Popielarski prof. PP
pawel.popielarski@put.poznan.pl

Lecturers

Prerequisites

The student has basic knowledge of the physics of phenomena and materials science (including heat transfer, flows, stresses, materials science, crystallization, phase transformations), CAD geometry systems and the basics of manufacturing engineering. Obtaining information from Polish and foreign- language literature and the Internet, can use the acquired knowledge to choose a technology selection strategy. In addition, understanding the need to learn, acquire new knowledge and cooperate in a team.

Course objective

The aim of the course is to familiarize students with the issues of computer simulation of processes in materials technologies

Course-related learning outcomes

Knowledge:
1. The student has knowledge of the basics of hard and soft modeling, is able to define the principles of model formulation and the uniqueness conditions for basic technological processes.
2. Is able to identify a problem requiring solution through virtualization and develop CAD geometry for transfer to a simulation system.

3. Is able to prepare and control the course of numerical calculations carried out on a computer using a commercial simulation system and analyze the obtained results.

Skills:
1. Is able to develop databases for simulation calculations and test their usefulness.
2. Is able to complete the full task of virtualization of a technological process after mastering the indicated simulation system.
3. Is able to analyze the results (post-processing) and plan and conduct validation studies regarding the obtained results.

Social competences:
1. Is able to work on a given task independently and cooperate with team members, using the synergy of knowledge and experience.
2. Understands the need for continuous education in order to improve professional engineering qualifications. .

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Written assessment carried out at the end of the semester (pass if at least 50.1% of correct answers are obtained). Up to 50.0% - ndst, from 50.1% to 60.0% - dst, from 60.1% to 70.0% - dst+, from 70.1 to 80% db, from 80.1% to 90 .0% - db+, from 90.1% - very good
Laboratories:
Passing the laboratories - Final grade on a grade scale from 2 to 5 - average of the grades from the laboratories (all must be graded positively, above grade 2)

Programme content

Principles of formulating mathematical and physical models.
Modeling of coupled phenomena. Modeling as applied to computer simulation.
Conditions of uniqueness in terms of necessary model simplifications.
Macro- and micro-modeling of phenomena.
Simulation of product manufacturing processes using loss-free technologies.
Simulation of stresses and deformations occurring in products obtained using loss-free technologies.
Examples of applications in loss-free technologies of product manufacturing processes.
Lab
Development of a concept of technology for manufacturing a product with a specific structure using a CAD system and simulation code. Independent preparation of a CAD model of the tool + product system (e.g. injection mold + molding, forging die-forging, mold-casting) and transfer of the solid model to the simulation program. Importing a solid medel in the simulation code and defining uniqueness conditions. Independent preparation and implementation of simulations. Analysis of simulation results. Forecasting the quality of products using loss-free technologies. System validation using the acquisition of real production data.

Course topics

The issues of computer simulation of processes in materials technologies.

Teaching methods

LLecture: multimedia presentation, illustrated with examples on the blackboard.
Laboratory: practical exercises.

Bibliography

Basic:
1. Jaskulski A., Autodesk Inventor 2020 PL, Podstawy metodyki projektowania, Wydawnictwo Naukowe PWN, Warszawa 2019
2. Z. Ignaszak, Podstawy modelowania CAD/CAE. Wybrane zagadnienia, e-skrypt, Poznań, 2008
3. Magmasoft academy, Kom-Odlew, Kraków 2022

4. Nova Flow&Solid CV manual, 2021

Additional:
K1. W. Przybylski, M. Deja Komputerowe wspomagane wytwarzanie maszyn. Podstawy i zastosowanie, WNT, 2007.
2. Z. Ignaszak Virtual prototyping w odlewnictwie, Bazy danych i walidacja. WPP Poznań 2002
3. E. Chlebus Techniki komputerowe CAx w inżynierii produkcji, WNT, 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	34	1,50