COURSE DESCRIPTION CARD - SYLLABUS

Course name

CAE in material processing

Course

Field of study

Mechanical engineering

Year/Semester

3 / 6

Area of study (specialization)

Technology of Materials Processing

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

-0

Tutorials

-

Projects/seminars

-0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

DSc. Eng. Paweł Popielarski

email: pawel.popielarski@put.poznan.pl

Phone: + 48 61 665-2467

Faculty of Mechanical Engineering

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Student has basic knowledge of physics and materials science (including heat transfer, flows, stresses, materials science, crystallization, phase transformations), CAD geometry systems and the basics of manufacturing engineering. Has also skills in Acquiring information from literature survey and internet, is able to use the acquired knowledge to choose a technology selection strategy and understand the necessity to learn, taking new knowledge and collaboration in a workgroup.

Course objective

Student should obtain knowledge about the application of the theory of energy and mass flow in modeling and simulation of processes in material technologies (on examples of various technologies).

Course-related learning outcomes

Knowledge

1. Student has basic knowledge related to the basics of hard and soft modeling, knows how to define the principles of model formulation and the conditions of uniqueness for basic technological processes - [K_W09]

2. Has basic knowledge of the requirements for CAD geometry for transfer to the simulation system - [K_W09]

3. Has knowledge of the preparation and control of the course of numerical calculations carried out by computer using a commercial simulation system and knows how to analyze the obtained results - [K_W09]

Skills

1. Can develop databases for simulation calculations and test their usefulness - [K_U09]

2. Is able to complete the task of virtualization of the technological process, e.g. casting, after mastering the indicated simulation system - [K_U17]

3. Is able to analyze the simulation results (post-processing) and plan and carry out validation studies on the obtained results - [K_U08]

Social competences

1. Can work on a given task independently and cooperate in a team - [K_K03]

2. Understands the need for continuous training to improve professional qualifications - [K_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written test, maximum number of points from lectures = 15 points.;

7.5 - 9.0 points - 3.0

9.1 - 10.5 points - 3.5

10.6 - 12.0 points - 4.0

12.1 - 13.5 points - 4.5

13.6 - 15.0 points - 5.0

Laboratory classes:

Completion of laboratories - Final grade on a scale of marks from 2 to 5 - average of three marks from laboratories (all must be positively assessed, above the mark 2)

Programme content

Lecture

Principles of formulating mathematical and physical models. Identification of models in the technological process. The certain conditions in terms of the necessary model simplifications. Analytical and numerical solutions. Macro and micro modeling of phenomena. Theoretical basis of flows. The basics of heat flow. Tthe basics of diffusion. An outline of the basics of filtration. Direct and inverse modelling. Material and physical coefficients determined from inverse problems. Modeling of coupled phenomena. Modeling in application to computer simulation. Outline of the basics of the state of stress and strain. Examples of applications in material processing technologies (foundry, metal forming, plastics processing).

Laboratory classes

CAD-CAE systems and application rules. Examples of virtual product designs (concept, geometry, geometry transfer in specific formats). CAE modules for individual NovaFlow & Solid, ProCast, Calcosoft, PamStamp, MoldFlow technologies). Independent preparation and implementation of the casting process simulation. Identification of phenomena on the basis of simulation results. Forecasting the quality of products on the basis of examples of cast products.

Teaching methods

Lecture: multimedia presentation, illustrated with examples on the board.

Laboratory classes: practical exercises.

Bibliography

Basic

1. M. Perzyk i inni, Odlewnictwo. WNT, Warszawa 2004.

2. E. Fraś, Krystalizacja metali PWN Warszawa 2003.

3. M. Perzyk i inni, Materiały do projektowania procesów odlewniczych. PWN Warszawa 1990.

Additional

1. B. Mochnacki, J. Suchy Modelowanie i symulacja krzepnięcia odlewów, , PWN, 1993

2. J. Braszczyński, Teoria procesów odlewniczych, PWN, Warszawa, 1989

3. B. Mochnacki Poradnik Odlewnictwo, tom II (rozdz. XVII) , PWN, Warzawa, 1986

4. E. Chlebus Techniki komputerowe CAx w inżynierii produkcji, WNT, 2000

5. W. Przybylski, M. Deja Komputerowe wspomagane wytwarzanie maszyn. Podstawy i zastosowanie, , WNT, 2007.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	35	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	1,0

[1] delete or add other activities as appropriate