COURSE DESCRIPTION CARD - SYLLABUS

Course name
Materials technology and theory of machines in chemical [S1IChiP1>MiMC]

Course

Field of study
Chemical and Process Engineering

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

4,00

Coordinators

dr inż. Waldemar Szaferski
waldemar.szaferski@put.poznan.pl

Lecturers

dr inż. Andżelika Krupińska
andzelika.krupinska@put.poznan.pl

dr inż. Waldemar Szaferski
waldemar.szaferski@put.poznan.pl

Prerequisites

Knowledge in the field of mathematics, physics and the basics of technical drawing and engineering graphics. Ability to read and understand technical drawings. Readiness to make decisions and cooperate within a specified team and be aware of the need of lifelong learning.

Course objective

The goal of the course is to acquire the knowledge about strength properties of construction materials used in the assembly of process apparatus. Other aims of the course are to familiarize with the elements of machines occurring in the construction of industrial apparatus and devices, and development of engineering skills for independent designing of the process equipment.

Course-related learning outcomes

Knowledge:
1. student knows the basic concepts in the field of strength of materials, [k_w13]

2. student knows the basic concepts associated with the forces occurring in the construction of machines and equipment, [k_w13]
3. student knows the basic elements of machines found in the process facility, [k_w12, k_w13]
4. student knows the selection criteria of materials for the components of process equipment, [k_w12]
5. student knows the effects of the equipment's working conditions on their strength in the assumed working time, [k_w4, k_w14]
6. student knows the process of designing the pressure vessel, [k_w12]

Skills:
1. student can use the basic physical and chemical laws in the construction of industrial equipment, [k_u1, k_u5]
2. student can describe and select machine elements and their joins, [k_u15]
3. student can choose the right type of construction material for the designed process equipment, [k_u27, k_u7]
4. student is able to assess the influence of the type of selected material on the working time of equipment in terms of corrosivity, [k_u8]
5. student can design a pressure vessel which is the basic laboratory and industrial equipment in chemical facilities, [k_u31]

Social competences:
1. student knows the limits of her/his own knowledge and understands the need for continuous education and improving the professional skills, [k_k1]
2. student knows the advantages and disadvantages of team work, [k_k3]
3. student can think and act in a creative and entrepreneurial way, [k_k6]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Knowledge acquired in the lecture is being verified at the final exam (after 15th lecture). The exam consists of 40-50 test questions (constant scores for all questions) or 5-10 open questions (different scores). Passing threshold: 51% points. Issues required for final exam on the basis of which questions are prepared will be sent to students by e-mail using the university electronic messaging system.
Skills acquired in the project classes are verified on the basis of the preparation of individual project task and passing the classes in the form of oral verification of the submitted project, consisting of 3-5 open-ended questions related to the project. Passing threshold: 51% of points from oral answer and the correctness of prepared project task.
If the classes will be held remotely, the forms of course assessments will remain unchanged and will be carried out with the use of tools provided by the Poznań University of Technology (https://elearning.put.poznan.pl/), about which students will be informed as soon as possible possible.

Programme content

As a part of the course, basic knowledge of materials used in the construction of process apparatus such as: alloy steels, cast steel and cast iron, non-ferrous metals and their alloys, construction plastics and natural materials will be presented. The effect of various factors on the corrosion rate and protective coatings applied in process equipment. Fundamentals of strength of materials and elements of machines and their joints. The discussion of the most important types of normal stresses (tension, compression, buckling, surface thrusts, bending), tangential stresses (shearing, torsion) and reduced stresses. Practical calculations of strength of apparatus elements, their joints and methods of joining individual elements of apparatus and process fittings. Design principles of pressure vessel as a basic laboratory apparatus and process apparatus of chemical installations.

Teaching methods

1. Lecture: multimedia presentation illustrated with examples given on the board, and support materials sent to students by e-mail using the university electronic messaging system.
2. Project: multimedia presentation illustrated with examples given on the board, and completing tasks given by the teacher - practical exercises.

Bibliography

Basic
1. Potrykus J., Poradnik mechanika, REA, Warszawa 2008
2. Wilczewski T., Pomoce projektowe z podstaw maszynoznawstwa chemicznego, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2008
3. Lewandowski W.M., Ryms M., Maszynoznawstwo chemiczne podstawy wytrzymałości i przykłady obliczeń, PWN, Warszawa 2017
4. Pikoń J.: Podstawy konstrukcji aparatury chemicznej, cz. I i II, PWN, Warszawa 1979
5. Biernat J., Materiałoznawstwo. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2016
Additional
1. Bańkowski Z., Mały poradnik mechanika. T. 1, Nauki matematyczno-fizyczne, materiałoznawstwo. Wydawnictwa Naukowo-Techniczne, Warszawa 1996
2. Bańkowski Z., Mały poradnik mechanika. T. 2, Podstawy konstrukcji maszyn, maszynoznawstwo. Wydawnictwa Naukowo-Techniczne, Warszawa 1994
3. Niezgodziński T., Wytrzymałość materiałów. Wydawnictwo Naukowe PWN, Warszawa 2010
4. Matczyński F., Mechanik : poradnik techniczny. T. 2. Cz. 2, Materiałoznawstwo. Państwowe Wydawnictwa Techniczne, Warszawa 1960
5. Lewandowski W., Melcer A., Zadania z maszynoznawstwa chemicznego. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2011
6. Niezgodziński M.E., Niezgodziński T., Wytrzymałość materiałów. Wydawnictwo Naukowe PWN, Warszawa 2010
7. Bielewicz E., Wytrzymałość materiałów. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2013
8. Zielnica J., Wytrzymałość materiałów. Wydawnictwo Politechniki Poznańskiej, Poznań 2001

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,00
Classes requiring direct contact with the teacher	80	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50