COURSE DESCRIPTION CARD - SYLLABUS

Course name
Chemical engineering [N1TCh2>IC1]

Course

Field of study
Chemical Technology

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Students starting this subject should have basic knowledge in mathematics, physics, chemistry, statistics, engineering graphics, physical chemistry, thermodynamics, and materials technology. They should also have the ability to use spreadsheets, performing statistical analysis of measurement results and be ready to work in a team.

Course objective

The aim of the course is to give the student knowledge of the heat, mass and momentum transfer theories and the ability to perform process calculations.

Course-related learning outcomes

Knowledge:
1.Student has a basic knowledge of technical rheology [K_W11]
2.Student knows the basics of single and two-phase flow fluid dynamics [K_W10], [K_W13]
3.Student knows the basics of the heat transfer theory [K_W13]
4.Student knows the theoretical basis of sedimentation, filtration, absorption, distillation and rectification [K_W13]

Skills:
1.Student has the skills to perform of the process calculations associated with the heat transfer and fluid transport K_U08
2.Student has the skills to perform designs of equipment in which heat and momentum transfers occur K_U15
3.Student on the basis of acquired general knowledge has skills to explain of physical phenomena occurring in chemical installations K_U16
4.Student has can choose unit operation to solve a specific of technological problem K_U12

Social competences:
1.Student has the awareness and understanding of aspects of the practical application of knowledge and the effects of engineering activities K_K01
2.Student is able to interact and work in a group K_K02

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified during the test. The test consists of about 25 closed questions. Minimum threshold: 51% points. The issues, on the basis of which questions are formed, will be sent to students by e-mail using the university e-mail system. The online test will be conducted on the same terms via the eKursy platform.
The skills acquired during the project classes are verified on the basis of the documentation of the heat exchanger design and the defense of the project. The final grade is based on the arithmetic mean calculated from all the grades obtained (up to 2.74 - unsatisfactory; from 2.75 to 3.24 - sufficient; from 3.25 to 3.74 - a sufficient plus; from 3.75 to 4.24 - good; from 4.25 to 4.74 - a good plus; from 4.75 - very good). Examination will be in an online form on the same terms via the eMeeting platform or another platform recommended by the Poznań University of Technology.

Programme content

Issues related to chemical engineering.

Course topics

Course covers the following topics:
1.Shear flow of a Newtonian fluid
2.Characterization of non-Newtonian fluids
3.Flow of fluids in a pipe (laminar and turbulent flows, velocity distributions for laminar and turbulent flows, pressure drop for flow of Newtonian liquids through a pipe).
4.The continuity equation
5.General energy balance
6.Falling liquid films
7.Flow of fluids through porous beds
8.Motion of particles in a fluid
9.Sedimentation
10.Filtration
11.Heat transfer (mechanisms of heat transfer, thermal conduction, heat transfer by convection)

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board. In special cases, the online form of the lecture is allowed.
2. Project: Multimedia presentation, illustrated with tasks solved on the board.

Bibliography

Basic:
1. Zarzycki R.: Wymiana ciepła i ruch masy w inżynierii środowiska, WNT, Warszawa 2005.
2. Wiśniewski S., Wiśniewski T.S., Wymiana ciepła, WNT, Warszawa 2012.
3. Hobler T.: Dyfuzyjny ruch masy i absorbery, WNT, Warszawa 1976.

4. Hobler T.: Ruch ciepła i wymienniki, WNT, Warszawa 1986.
5. Koch R., Kozioł A., Dyfuzyjno-cieplny rozdział substancji, WNT, Warszawa 1994.
6. Broniarz-Press L. i inni: Inżynieria chemiczna i procesowa. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2000.
7. Palica M., Gierczycki A., Lemanowicz M., Operacje inżynierii chemicznej, część 1 i 2, Wydawnictwo Politechniki Śląskiej, Gliwice 2013.
8. Broniarz-Press L. i inni: Inżynieria Chemiczna i Procesowa. Materiały Pomocnicze. Części II-III. Wydawnictwo Politechniki Poznańskiej, Poznań 1999-2005.
9. Bandrowski J., Troniewski L.: Destylacja i rektyfikacja, Wyd. Politechniki Śląskiej, Gliwice 1996.
10. Koch R., Noworyta A.: Procesy mechaniczne w inżynierii chemicznej, WNT, Warszawa 1995.
11. Orzechowski Z., Prywer J., Zarzycki R.: Mechanika płynów w inżynierii środowiska, WNT, Warszawa 1997

Additional:
1. Coulson J.M., Richardson J.F.: Chemical Engineering, vol. I-VI, Butterworth Heinemann, Oxford 1999-2002.
2. Sinnott R.K. Towler G.: Chemical Engineering Design, 5th Edition, Elsevier, 2009.
3. Pohorecki R., Wroński S.: Termodynamika i kinetyka procesów inżynierii chemicznej, WNT, Warszawa 1977.
4. Oleśkowicz-Popiel C., Wojtkowiak J.: Eksperymenty w wymianie ciepła, Politechniki Poznańskiej, Poznań 2004.
5. Troniewski L.: Hoblerowskie ujęcie ruchu masy, Wydawnictwo WSI, Opole 1996.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	25	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00