COURSE DESCRIPTION CARD - SYLLABUS

Course name

Chemical Engineering

Course

Field of study

Chemical Technology

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

III/5

Profile of study

general academic

Course offered in

English

Requirements

compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	60	
Tutorials	Projects/seminars	

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Sylwia Różańska

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Responsible for the course/lecturer:

dr hab. inż. Jacek Różański

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Prerequisites

Students starting this subject should have basic knowledge in mathematics, physics, chemistry, statistics, engineering graphics, 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 provide knowledge of the heat, mass and momentum transfer theories and the ability to perform model studies.

Course-related learning outcomes

Knowledge

1. Student knows the basic concepts of chemical engineering dynamics of one- and two-phase flow of fluids. [K_W10], [K_W13]

2. Student knows basics of heat and mass transfer theories [K_W13]

3. Student knows the theoretical basis of filtration, absorption, distillation and rectification. [K_W13]

Skills

1. Student can assess the suitability of experimental methods for solving engineering tasks – [K_U14]

2. Student can to perform process calculations related to momentum, heat and mass transfers - [K_U08]

3. Student can to design equipments where momentum, heat and mass transfer take place - [K_U15]

4. Based on general knowledge student can explain basic phenomena related to important processes in chemical engineering - [K_U16]

5. Student can choose a unit operation suitable for a specific technological problem - [K_U12]

Social competences

1. The student can cooperate and work in a team [K_K03]

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 exam. The exam consists of 6 open questions for the same number of points. Minimum threshold: 50% points. Exam issues, on the basis of which questions are formed, will be sent to students by e-mail using the university e-mail system.

Skills and knowledge acquired as part of the laboratory are verified on a daily basis based on oral answers and 2 final tests, consisting of 4-6 open questions for the same number of points.

Programme content

Course covers the following topics:

1. Shear flow of the Newtonian fluid

2. 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).

3. The continuity equation

4. General energy balance

5. Falling liquid films

6. Flow of fluids through porous beds

7. Filtration

8. Heat transfer (mechanisms of heat transfer, thermal conduction, heat transfer by convection, forced convection in tubes, natural convection, condensation of vapours, boiling liquids)

9. Mass transfer (phase equilibrium, diffusion in the gaseous phase, diffusion in the liquid phase, convective mass transfer, mass transfer coefficient, overall mass transfer coefficients, absorption, distillation, rectification)

Teaching methods

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

2. Laboratory exercises: performing experiments related to heat, mass and momentum transfer processes.

Bibliography

Basic

1. Serth R.W., Lestina T.G., Process Heat Transfer, Principles, Applications and Rules of Thumb, Elsevier, 2nd edition, 2014

2. Coulson J.M., Richardson J.F.: Chemical Engineering, vol. I-VI, Butterworth Heinemann, Oxford 1999-2002.

3. Manglik Raj, Heat Transfer Fluid Flow Data Books, Genium Publishing Corporation, 2015

4. André B. de Haan, Hans Bosch, Industrial Separation Processes, Fundamentals, Walter de Gruyter GmbH, Berlin/Boston, 2013

5. Richardson J.F., Harker J.H., Backhurst J.R., Chemical Engineering Volume 2 - Particle Technology and Separation Processes (5th Edition), Elsevier, 2002

6. Kothandaraman C.P., Fundamentals of Heat and Mass Transfer, New Age International Ltd. Publisher, 2006

Additional

1. Hobler Tadeusz., Mass Transfer and Absorbers, 1st edition, International Series of Monographs in Chemical Engineering, 1966

2. Sinnott R.K. Towler G.: Chemical Engineering Design, 5th Edition, Elsevier, 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	100	4,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) [1]	50	2,0

[1] delete or add other activities as appropriate