COURSE DESCRIPTION CARD - SYLLABUS

Course name
Chemical engineering [N1TCh2>IC2]

Course

Field of study
Chemical Technology

Year/Semester
3/6

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
40

Other
0

Tutorials
0

Projects/seminars
20

Number of credit points

6,00

Coordinators

dr hab. inż. Jacek Różański prof. PP
jacek.rozanski@put.poznan.pl

Lecturers

Prerequisites

Students starting this subject should have basic knowledge in mathematics, physics, chemistry, statistics, engineering graphics, physical chemistry, thermodynamics, chemical engineering, 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 familiarize the student with methods of solving problems of momentum, heat and mass transfers as well as performing design calculations of mass exchangers.

Course-related learning outcomes

Knowledge:
1. Student knows the basics of the heat and mass transfer theory [K_W13]
2.Student knows the theoretical basis of drying, mixing and fluidization processes - [K_W13]
3.Student knows the basic measurement methods used in chemical engineering - [K_W15]

Skills:

1.Student can assess the suitability of experimental methods for solving engineering tasks - [K_U14]
2.Student is able to perform process calculations related to mass transfer - [K_U08]
3.Student can to design mass exchanger - K_U15]
4.Student can perform experimental research and design calculations in a team - [K_U02]

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 4 open questions for the same number of points (5 points). The grade will be issued according to a scale: up to 10.0 - unsatisfactory; from 10.5 to 11.5 - sufficient; from 12.0 to 13.5 - a sufficient plus; from 14.0 to 16.0 - good; from 16.5 to 18.0 - a good plus; from 18.5 - very good. 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.
Skills and knowledge acquired during project classes are verified on the basis of the mass exchanger project.

Programme content

Issues related to chemical engineering.

Course topics

Lecture
1. Heat transfer (heat transfer in laminar flow, natural convection, condensation of vapors, boiling liquids)
2. Mass transfer (phase equilibrium, diffusion in binary gas mixtures, diffusion in liquids, convective mass transfer, mass transfer coefficient, overall transfer coefficients, absorption, distillation, rectification)
Design issues: mass balance, mass transfer coefficients, overall mass transfer coefficients, calculation of packed exchanger.
Subjects of laboratory exercises:
1.Study of rheological properties of Newtonian and non-Newtonian fluids
2.Analysis of the mixing process of the homogeneous fluids
3.Study of falling liquid film on a flat plate
4.Study of sedimentation process
5.Study of filtration process on a filter press
6.Study of pressure drop in a packed tower
7.Study of solid-liquid fluidization process
8.Determination of the heat transfer coefficient under forced flow
9.Study of the drying kinetics

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board. In special cases, the online form of the lecture is allowed.
2. Laboratory exercises: performing experiments related to heat, mass and momentum transfer processes.
3. Project: Multimedia presentation, illustrated with tasks solved on the board.

Bibliography

Basic:
1. Bandrowski J., Merta H., Zioło J.: Sedymentacja zawiesin. Zasady i projektowanie, Wydawnictwo Politechniki Śląskiej, Gliwice 2001.
2. Bandrowski J., Troniewski L.: Destylacja i rektyfikacja, Wyd. Politechniki Śląskiej, Gliwice 1996.
3. Broniarz-Press L. i inni: Inżynieria chemiczna i procesowa. Materiały pomocnicze. I-III. Wydawnictwo

Politechniki Poznańskiej, Poznań 1999-2002.
4. Broniarz-Press L. i inni: Inżynieria chemiczna i procesowa. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2000.
5. Broniarz-Press L.: Hydrodynamika spływu filmowego cieczy i zjawiska przenoszenia w aparatach warstewkowych, Wyd. Politechniki Poznańskiej, Poznań 2004.
6. Dziubiński M., Kiljański T., Sęk J.: Podstawy reologii i reometrii płynów, Wydawnictwo Politechniki Łódzkiej, Łódź 2009.
7. Koch R., Noworyta A.: Procesy mechaniczne w inżynierii chemicznej, WNT, Warszawa 1995.
8. Zarzycki R., Wymiana ciepła i ruch masy w inżynierii środowiska, WNT, Warszawa 2009.
9. Troniewski L.: Hoblerowskie ujęcie ruchu masy, Wydawnictwo WSI, Opole 1998.

Additional:
1. Orzechowski Z., Prywer J., Zarzycki R.: Mechanika płynów w inżynierii środowiska, WNT, Warszawa 1997
2. Coulson J.M., Richardson J.F.: Chemical Engineering, vol. I-VI, Butterworth Heinemann, Oxford 1999-2002.
3. Sinnott R.K. Towler G.: Chemical Engineering Design, 5th Edition, Elsevier, 2009.
4. Pohorecki R., Wroński S.: Termodynamika i kinetyka procesów inżynierii chemicznej, WNT, Warszawa 1977.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00