# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of chemical and process engineering [S1IChiP1>PICiP]

## Course

Field of study
Chemical and Process Engineering

Year/Semester
2/4

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
45

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

## Number of credit points

4,00

## Coordinators

dr inż. Kinga Rajewska
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## Lecturers

## Prerequisites

The student has a basic knowledge of mathematics, physics and chemistry obtained during classes at the first grade of study, enabling understanding of physical and chemical phenomena in the field of heat and mass exchange and their mathematical description. Is able to acquire and supplement information on chemistry, physics and mathematics from academic textbooks and other books, has the ability to self-education, can work individually and in a team, plan and carry out experiments, interpret results and draw conclusions, can apply the principles of health and safety related to work. Understands the need for continuous training and setting ambitious goals on the way to achieve higher education, is aware of the responsibility for tasks carried out in team work.

## Course objective

Obtaining knowledge in the field of modeling and designing flow and heat processes and apparatus for the implementation of processes in the field of chemical and process engineering in the laboratory scale and the ability to transfer results to the scale of the prototype on a real scale.

## Course-related learning outcomes

Knowledge:

1. has broadened and deep knowledge in the field of mathematics necessary for modeling, planning, optimization and characterization of chemical processes as well as planning experiments and elaborating experimental results - k_w01.
2. has extended knowledge in the field of physics allowing to understand the physical processes related to chemical engineering - k_w02.
3. has broadened and deep knowledge in the field of chemistry and other related areas of science, allowing for the formulation and solving of complex tasks related to chemical engineering - k_w03.
4. has knowledge in the field of complex chemical processes, including the appropriate selection of materials, raw materials, equipment and devices for the implementation of chemical processes and characterization of the obtained products - k_w04.
5.knows the basic methods, techniques, tools and materials used to solve simple tasks in chemical engineering - k_w15.

Skills:
1. has the ability to acquire and critically evaluate information from literature, databases and other sources, and formulate opinions and reports on this basis - k_u01.
2. can prepare a chemical and process engineering study in polish and english - k_u03.
3. can independently determine the directions of further education and pursue self-study - k_u05.
4. can use professional software, using them to design chemical processes and process installations - k_u07.
5. can identify the basic processes and unit operations of chemical and process engineering - k_u17.
6. can choose the right way to solve simple engineering tasks related to chemical and process engineering - k_u18.

Social competences:
1. has awareness of the need for lifelong learning and professional development - k_k01.
2. has an educated awareness of the limitations of science and technology related to the protection of the natural environment - k_k02.
3. can think and act in a creative and enterprising way - k_k05.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Final grade for the written exam covering all the knowledge of the subject in the stationary or on-line form, depending on the method of conducting classes.
Skills acquired as part of the project classes are verified on the basis of tests on the elements of designing chemical engineering processes. Three tests are expected. Passing threshold: 50% of points.

## Programme content

As part of this course, the basics of chemical and process engineering are laid out, with the issues discussed being divided into flow and thermal processes. Flow processes include the issue of momentum transfer on the example of fluids. The scope of considerations in this topic covers incompressible fluids as well as real fluids with regard to fluid viscosity. Thermal processes include conduction, convection and radiation. The issues of heat penetration, heat transfer during free and forced convection as well as the principles of design heat exchangers are presented. Elements of moist air thermodynamics as well as the basics of filtration and filtering theory are also discussed. Diffusion processes refer to the flow of multicomponent fluids. Presented are stationary and not-stationary issues of diffusion, basics of convective mass flow and design principles of mass exchangers. The problems of simultaneous heat and mass exchange occurring, for example, in drying issues are discussed. For mathematical description of processes used differential and integral calculus as well as principles of dimensional analysis and theory of similarity.

## Teaching methods

1. Lecture: multimedia presentation, illustrated with examples taken on the board.
2. Design classes: solving examples on the board and completing tasks given by the teacher.

## Bibliography

Basic
1. Kowalski S.J., Teoria procesów przepływowych cieplnych i dyfuzyjnych, Wydawnictwo Politechniki Poznańskiej, Wyd. 1999 oraz 2008.
2. Kembłowski Z., Michałowski S., Strumiłło Cz., Zarzycki R., Podstawy teoretyczne inżynierii chemicznej i procesowej, Warszawa, PWN 1985.
3. Malczewski J., Piekarski M., Modele procesów transportu masy, pędu i energii, Warszawa, PWN 1992.
4. Zadania projektowe z inżynierii procesowej, Biń A., Huettner M., Kopeć J., Kozłowski M., Nowo-sielski J., Sieniutycz S., Szembek-Stoeger M., Szwast Z., Wolny A., Wyd. Politechniki Warszawskiej 1986.
5. Ciborowski, J., Inżynieria procesowa, Warszawa, WNT 1973.
6. Hobler T., Ruch ciepła i wymienniki, wyd. 4, Warszawa, PWN 1971.
Additional
1. Brodowicz K., Teoria wymienników ciepła i masy, PWN-Warszawa, 1982.
2. Malczewski J., Piekarski M., Modele procesów transportu masy, pędu i energii, PWN-Warszawa, 1992.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 100 | 4,00 |
| Classes requiring direct contact with the teacher | 62 | 2,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 38 | 1,50 |