COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fundamentals of Chemical Technology

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

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Katarzyna Dopierała, PhD Eng.

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Phone: 6653772

Faculty of Chemical Technology

Institute of Chemical Technology and Engineering

Berdychowo 4, 60-965 Poznań

Responsible for the course/lecturer:

Monika Rojewska, PhD Eng.

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Phone: 6653772

Faculty of Chemical Technology

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Berdychowo 4, 60-965 Poznań

Prerequisites

Fundamental knowledge of general, inorganic and organic chemistry as well as physical chemistry, chemical thermodynamics and fundamental mathematical skills at academic level.

Course objective

The aim of course is to gain the knowledge and practical skills in implemantation of technological process starting from process designing, trough mass and energy balance, selection of reactor for

technological process taking inot account kinetic, thermodynamic constraints and issues related to scalling-up.

Course-related learning outcomes

Knowledge

K_W03 has necessary knowledge of chemistry at the level relevant to proper understanding the chemical phenomena and processes

K_W09 has necessary knowledge of natural and synthetic resources, products and processes used in chemical technology, and knowledge of development paths in chemical industry both at national and worldwide level

K_W12 knows the rules determining the construction, operation and selection of the equipment, reactors and devices used in chemical technology

Skills

K_U03 is able to prepare the technological documentation and communicate trough different media in proffesional work environment

K_U18 distinguishes between types of chemical reactions and is able to select the proper reaction for specific process

K_U26 evaluates the risk related to scaling-up the operations and chemical processes

K_U33 solves the fundamental enginnering problems related to implementation of processes and unit operations in chemical technology

Social competences

K_K01 - understands the need of self-study and improving his or her professional skills

K_K02 - has awarness and understanding of non-technical aspects and effects of engineering activity, including its impact on natural environment

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Exam in the form of writing assignment graded in the range 0-100 pts and the following grading scale is applied:

3	51 -70 pts
4	71-90 pts
5	91 -100 pts

and graded student's activity during laboratory classes including correct laboratory reports. The following grading scale is applied:

3	fundamental knowledge and laboratory skills

4 knowledge and skills over the minimum level

5 precisely implemented tasks, independent searching of possible solutions, coordianation of team work, ambitious attitude in solving problems

Programme content

The following topis are included within the course:

1. Stages in making the technological project

2. Chemical concept of the process

a) stochiometric analysis of the process (fundamental definitions, mass balance of the reactions),

b) thermodynamic analysis of the process (sources of thermodynamic data, chemical equilibrium constant and thermodynamic potential, calculations of the equilibrium composition, calculations of chemical equilibrium constant for chemical reaction)

c) kinetic analysis of the process (rate of chemical-technological process, rate of chemical reaction; impact of temperature and pressure on chemical kinetics, kinetic plots)

3. Technological concept of the process (technological priniciples and green chemistry principles)

4. Scaling-up the process

5. Technological scheme (idea scheme of the process, mass and energy balance of the process)

6. Enthalpy plots (stoichiometric process)

7. Thermodynamic and kinetic analysis of the reacting system

8. Classification and characterization of chemical reactors

9. Mass and energy balance of chemical reactors

10. Selection of reactor type for specific chemical reaction

Teaching methods

Lecture illustrated by multimedia presentation and group discussion

Laboratory classes: practical excercises

Bibliography

Basic

1. S. Simons, Concepts of Chemical Engineering for Chemists (2nd Edition), Royal Society of Chemistry, 2017

2. E. Santacesaria, R. Tesserhe, Chemical Reactor from Laboratory to Industrial Plant, Springer, 2018

3. J. Ancheyta, Chemical Reaction Kinetics: Concepts, Methods and Case Studies, John Wiley and Sons, 2017

4. H. Metiu, Physical chemistry, Kinetics, Taylor and Francis, 2006

Additional

1. E. Johnson, Sustainability in the Chemical Industry, Springer, 2012

2. Stanley I. Sandler Chemical and engineering thermodynamics, New York, John Wiley & Sons, 1989.

3. James J. Carberry Chemical and Catalytic Reaction Engineering, New York : McGraw-Hill, 1976.

4. A.R. Cooper A.R., G.V. Jeffreys, Chemical Kinetics and Reactor Design , Edinburgh : Oliver and Boyd, 1971

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	75	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	50	2,0

[1] delete or add other activities as appropriate