COURSE DESCRIPTION CARD - SYLLABUS

Course name
Process safety in chemicals industry [S1TCh2>BPwPC]

Course

Field of study
Chemical Technology

Year/Semester
4/7

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
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Piotr Mitkowski
piotr.mitkowski@put.poznan.pl

Lecturers

Prerequisites

Student knows basics of algebra and probability theory, basic laws of heat, mass and momentum transfers, basic chemical reaction engineering. Student has basic knowledge in the field of construction and operating principles of apparatus and fittings in chemical and related industries, and industrial automation. Student is able to read and understand process flow diagrams (PFD) and simple piping and instrumentation diagrams (P&ID).

Course objective

The aim of the course is to familiarize the student with the basic principles of safe operation of industrial equipment and fittings as well as qualitative methods and techniques for identifying industrial risk. Student is acquainted with the analysis of the causes and effects of selected accidents known from the petrochemical, food and related industries.

Course-related learning outcomes

Knowledge:
1. Student knows the legal basis of process safety under the Polish and European Union laws. [K_W018]
2. Knows the basic threats that may result from the use of chemical substances in industrial processes.

[K_W018]
3. Knows the principles of process safety analyzes: HAZOP, FTA and ETA. [K_W018, K_W15]
4. Knows the basic aspects related to the location of process equipment and the location of chemical and related industries plants. [K_W015, K_W018]
5. Knows the basic aspects of occupational health and safety in the chemical industry. [K_W018]
6. Knows the basic aspects of occupational health and safety in the chemical, petrochemical and food industries resulted from the analysis of industrial accidents and ecological disasters. [K_W015, K_W018]

Skills:
1. Student is able to effectively use chemical safety data sheets to identify process hazards. [K_U01, K_U25]
2. Is able to identify the main steps of the chemical risk assessment. [K_U25]
3. Is able to use HAZOP, FTA and ETA for basic hazard identification. [K_U25]
4. Is able to assess the impact of changing the scale of technological operations on the process safety. [K_U26]

Social competences:
1. The student knows the limitations of her/his own knowledge and understands the need for continuous education and raising their professional competences, with particular emphasis on ongoing analysis of industrial accidents. [K_K01]
2. The student is aware and understands the social aspects of the practical application of acquired knowledge and skills in the field of process safety and related with it responsibility. [K_K02]
3. The student is aware of the professionalism and compliance with the principles of professional ethics in relation to the storage and processing of chemical substances and hazardous events. [K_K05]
4. Student is aware of the advantages and limitations of individual and group work in solving interdisciplinary problems in industry. Is aware of the responsibility of jointly implemented tasks as part of teamwork. [K_K03]
5. Student is aware of the professionalism and compliance with the principles of professional ethics in relation to the storage and processing of chemical substances and hazardous events. Student understands the need to formulate and communicate in an understandable way information necessary to ensure safety, especially for non-engineers. [K_K05, K_K07]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The acquired knowledge during the lectures is verified by the test. The test consists of about 30 closed and 5 open test questions. Passing threshold is 51% points.
Practical application of acquired skills in the form of a report on selected aspects of process safety analysis for a exemplar part of the process installation. Reports are created in a group of several people. The required material and appropriate references for questions will be delivered in the university's e-Learning system.

Programme content

As part of the course the following issues are discussed:
1. Basic terminology related to the occupational health and safety risk and industrial risk analysis.
2. Legal basis related to preparation of a safety report and location of an industrial plant (Environmental Protection Law together with relevant SEVESO III Directive), fire protection and guidelines for the use of equipment in potentially explosive areas (ATEX Directive, selected standards).
3. Rules for the location of industrial apparatuses and the location of chemical and related industries plants.
4. Methods supporting the identification and assessment of hazards such as: HAZOP, fault tree (FTA), event tree (ETA), FMEA. The methods are supported by examples.
5. Analyzes of selected accidents and failures in the chemical, petrochemical and related industries.

Teaching methods

Multimedia presentation, materials shared in the university's e-Learning system.

Bibliography

Basic:
1. Markowski Adam S., Bezpieczeństwo procesów przemysłowych, 2017, Wydawnictwo Politechniki Łódzkiej, ISBN: 978-83-7283-805-6
2. Mitkowski P.T., Analiza ryzyka w przemyśle chemicznym, 2012, Wydawnictwo Politechniki Poznańskiej, ISBN: 978-83-7775-202-9

Additional:
1. Crowl D. A., Louvar J. F., Chemical Process Safety. Fundamentals with Applications, Pearson Education INC, 2011.
2. Atherton J., Gil F., Hoboken, N.J,. Incidents that define process safety, Center for Chemical Process Safety, Wiley, 2008.
3. Guidelines for Process Safety Fundamentals in General Plant Operations, Center for Chemical Process Safety of the American Institute of Chemical Engineers, Nowy Jork, 1995 (dostęp elektroniczny przez www.library.put.poznan.pl).
4. Sanders R. E., Chemical Process Safety - Learning from Case Histories (3rd Edition), Elsevier, 2005 (dostęp elektroniczny przez www.library.put.poznan.pl).
6. Zarządzanie ryzykiem w przemyśle chemicznym i procesowym, Praca zbiorowa pod redakcją Adama S. Markowskiego, Wydawnictwo Politechniki Łódzkiej, 2001.
7. Woliński M., Ogrodnik G., Tomczuk J., Ocena zagrożenia wybuchem, Szkoła Główna Służby Pożarniczej, Warszawa, 2002.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00