COURSE DESCRIPTION CARD - SYLLABUS

Course name
Acoustic methods

Course

Field of study
Chemical and Process Engineering

Year/Semester
1/1

Area of study (specialization)
Chemical Engineering

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
Dominik Mierzwa, Ph.D.

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Phone No.: 61-665-3969

Responsible for the course/lecturer:

Prerequisites

The student who starts the subject should: have a basic knowledge of physics, chemistry, and mathematics that allows understanding and description of phenomena and processes related to chemical and process engineering; is able to obtain information from literature, databases and other sources related to the subject; understand the need for further training and raising one's competences.

Course objective

Presentation of basic knowledge on the use of acoustic techniques in engineering research and indutrial processes, presentation of the current state of the art and the possibilities of applying individual solutions in practice.

Course-related learning outcomes

Knowledge

1. Has extensive knowledge of physics and chemistry to understand the processes and phenomena associated with ultrasound. (K_W02)

2. Has knowledge of complex chemical processes, including the appropriate selection of materials, raw materials, apparatus and equipment for carrying out chemical processes and characterizing the products obtained. (K_W04)

Skills

1. Has the ability to analyze and solve problems related to chemical technology and process engineering. (K_U09)

2. Can verify concepts of engineering solutions about the state of knowledge in chemical and process engineering as well as chemical technology. (K_U10)

Social competences

1. Understands the need for continuous learning and updating previously acquired knowledge. (K_K01)

2. Can interact and work in a group. (K_K03)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The grade for the lectures is determined on the basis of the final test result, consisting of at least 40 questions of various types (single / multiple choice, supplement, calculation, marking on a drawing / diagram, simple accounting task, etc.), assessed according to the scale: 51 % -60% (3.0), 61% -70% (3.5); 71% -80% (4.0), 81% -90% (4.5), 91% -100% (5.0). The test will be carried out stationary or remotely via the Ekursy platform.

The assessment from laboratories is determined on the basis of the average of the grades for the reports made during the classes, according to the following scale: 51% -60% (3.0), 61% -70% (3.5); 71% -80% (4.0), 81% -90% (4.5), 91% -100% (5.0).

Programme content

The scope of the subject includes the following issues: definition of mechanical waves and their division, mathematical description of mechanical waves with particular emphasis on ultrasound, methods of ultrasonic production and detection, description of operation and phenomena caused by low and high power ultrasound, presentation of practical applications and industrial technologies using ultrasound, acoustic emission and its application.

During the laboratory classes, students have the opportunity to learn about the basic issues of measuring the acoustic properties of a medium, the use of mechanical waves to measure physical quantities and imaging the internal structure, and determine the energy effects caused by waves.

Teaching methods

1. Lecture: multimedia presentation supported by examples presented on the board.

2. Laboratory: discussion in the laboratory group and execution of the exercises provided for in the laboratory program - practical exercises.

Bibliography

Basic

1.Metody akustyczne w badaniach inżynierskich, wyd. 1. Banaszak J., Kowalski S.J., Wydawnictwo Politechniki Poznańskiej, Poznań, 2011

2. Ultradźwięki i ich zastosowania, wyd. 2. zmienione. Śliwiński A., WNT, Warszawa, 2001

Additional

1. Ultrasonics: Fundamentals, Technologies, and Applications, wyd. 3. Ensminger D., Bond L.J., CRC Press, Boca Raton (FL, USA), 2011.

2. Handbook on applications of ultrasound: sonochemistry for sustainability, wyd. 1. Chen D., Sharma S.K. Mudhoo A., CRC Press, Boca Raton (FL, USA), 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1]	30	1,0

[1] delete or add other activities as appropriate