



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Methods of technological process control [S1IChiP1>MKPT]

Course

Field of study

Chemical and Process Engineering

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

30

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Basic physical, inorganic, organic and analytical chemistry on academic level; knowledge of mathematical tools used in chemical calculations; Can use basic laboratory techniques of separation and cleaning of chemical compounds

Course objective

The aim of the course is to familiarize students with modern methods of process control applied in chemistry, pharmacy, and biotechnology. Particular emphasis is placed on practical applications – monitoring of reaction processes, quality control of products, and integration of measurement systems with production processes.

Course-related learning outcomes

Knowledge:

1. techniques in process control - [k_w03,k_w11]

2. can describe methods, techniques, tools and materials used for the solution of simple problems connected with process control - [k_w07, k_w15]

Skills:

1. student can select the proper technique for process control - [k_u11, k_u16, k_u20]
2. student has basic skills for maintenance of gas or liquid chromatograph and to perform the chromatographic analyses - [k_u07, k_u21]
3. student can discuss chromatographic problems in english - [k_u03]

Social competences:

1. student understands the need to supplement her/his education and increasing professional competences. - [k_k01]
2. student has the awareness to obey the engineer ethic rules. - [k_k02, k_k05]
3. student can act and cooperate in the group accepting different roles. - [k_k03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Final written control work. In case of stationary work 10-15 open questions. In case of on-line work approx. 10 open questions and 10 closed questions.

Permanent control before laboratory classes. Written reports from exercises.

Programme content

1. Chemical risk in technological process..
2. Risk assessment in the technological systems.
3. Control and monitoring systems.
4. High performance liquid chromatography – various types of liquid chromatography; backgrounds of separation; columns in HPLC; HPLC and TLC equipment.
5. Qualitative and quantitative analysis in chromatography.
6. Process analysis – general rules of application of process analyzers.
7. Economical aspects of process control.
8. Collection and sample preparation systems for process analysis.
9. Column switching in gas and liquid process chromatography.
10. Application of deferred standard in chromatographic process analysis.
11. Application of GC i HPLC in chromatographic process analysis.
12. Examples of application of chromatographic process analysis in the control of selection technological processes.

Course topics

The course covers both fundamental and advanced methods of process control applied in chemistry, pharmacy, and biotechnology. Topics include classical measurement techniques such as physical, chemical, and electrochemical sensors, as well as chromatographic methods (HPLC, GC, process chromatography) with detectors and automation systems. A significant part of the course is devoted to spectroscopic methods: UV-Vis, IR, NIR, and Raman, along with hyperspectral techniques and spatial-spectral imaging. Coupled methods, laser-based techniques, biosensors, and biological approaches are also discussed. Particular emphasis is placed on practical applications of these methods in monitoring reaction processes, product quality control, mixture analysis, and the integration of measurement systems with production processes.

Teaching methods

lecture laboratory classes

Bibliography

Basic

1. Podstawy chromatografii, Z.Witkiewicz, WNT, Warszawa, 2005.
2. Zastosowanie metod chromatograficznych, K. Bielicka-Daszkiwicz, K. Milczewska, A. Voelkel, Wyd. PP, Poznań, 2005, 2010.

Additional

1. The essence of chromatography, C.F. Poole, Elsevier, Amsterdam, 2003.

2. Techniques and practice of chromatography, R.P.W.Scott, Marcel Dekker, Inc., Nowy Jork, 1995.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	65	2,60
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,40