COURSE DESCRIPTION CARD - SYLLABUS

Course name
Statistical analysis in technological processes [S2TOZ1-RMiOC>ASwPT]

Course

Field of study
Circular System Technologies

Year/Semester
2/3

Area of study (specialization)
Material recycling and chemical recovery

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
0

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
30

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Knowledge of basic concepts related to statistics and chemometrics. Basic skills in statistical processing of measurement data. Proficiency in using Excel spreadsheets and basic familiarity with the Statistica software. The student should have the ability to gather information from specified sources, as well as the skills to interpret and draw conclusions from this information.

Course objective

Acquiring knowledge and skills in applying statistical methods for validation and verification of technological and laboratory processes. Familiarization with statistical methods for process control and management of technological processes

Course-related learning outcomes

Knowledge:
K_W15 - Has systematic and in-depth knowledge of process control in technological processes, understands the rationale behind process control, and recognizes the benefits it brings to technologies associated with the circular economy and the natural environment.
K_W14 - Knows and understands the fundamental processes in the life cycle of equipment and devices,

objects, and technical systems used in circular economy technologies.

Skills:
K_U05 - Is able to independently plan and engage in lifelong learning to enhance personal professional competencies.
K_U07 - Can formulate and test hypotheses and opinions, and communicate effectively on topics related to tasks in the circular economy, using appropriate terminology, including in a foreign language.
K_U12 - Is skilled in planning and conducting experiments related to circular economy technologies, as well as interpreting the results and drawing conclusions.

Social competences:
K_K03 - Critically evaluates their own knowledge and understands the need for continuous education and the improvement of their professional, personal, and social competencies.
K_K02 - Recognizes the importance of promoting knowledge about sustainable production and technological solutions within the circular economy.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The final test focused on the practical application of topics covered during lectures and exercises. It will consist of several practical tasks to solve, related to the subjects discussed in class. The test will take place in a computer lab.

Programme content

During the course, students acquire fundamental theoretical and practical knowledge on the application of selected statistical methods in the control of technological and laboratory processes.

Course topics

The course will cover the following topics:
1. Validation/verification of technological and laboratory processes. Application of standards (ISO, ASTM, national) in practice. Selection of statistical tests, estimation of uncertainty in laboratory testing and technological processes, basic methods for determining repeatability and reproducibility of standard measurement methods.
2. Introduction to process control. Process stability analysis. Creation, management, and analysis of control charts. Process capability and performance indicators. Statistical process control.
3. Indicators of equipment and machinery efficiency. Analysis of metrics that assess the effective utilization of machines and equipment.

Teaching methods

A theoretical introduction to statistical analysis in technological processes. This will include practical applications of the discussed topics through selected examples and problem-solving exercises. Additionally, there will be discussions and a review of challenges related to each specific topic.

Bibliography

Basic:
1. W. Hyk, Z. Stojek, Analiza statystyczna w laboratorium badawczym. PWN, 2024
2. Internetowy podręcznik statystyki (http://www.statsoft.pl/textbook/stathome.html)
3.Handbook for calculation of measurement uncertainty in environmental laboratories, Nordtest
4. S. L. R. Ellison and A. Williams (Eds). Eurachem/CITAC guide: Quantifying Uncertainty in Analytical Measurement, 2012

Additional:
1. PN-ISO 5725
2. J. Miller, J. Miller, Statystyka i chemometria w chemii analitycznej, PWN, Warszawa 2016
3. A. Stanisz, Podręczny kurs statystyki, Wydawnictwo StatSoft, Kraków, 2006
4. P. Tatarzycki, Statystyka po ludzku, Internetowe Wydawnictwo Złote Myśli, 2007

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