



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Chemometrics and elements of statistics [S1TCh2>CiES]

### Course

Field of study

Chemical Technology

Year/Semester

2/4

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

15

Laboratory classes

0

Other

0

Tutorials

30

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

dr inż. Joanna Łechtańska

joanna.lechtanska@put.poznan.pl

### Lecturers

### Prerequisites

The student starting this course should have basic knowledge of mathematics needed to solve problems related to statistics and chemometrics. He should also have the ability to obtain information from the indicated sources (literature, databases) and the ability to interpret it, draw conclusions and formulate opinions. The student should also have a basic understanding of the Excel spreadsheet.

### Course objective

Provide students with basic knowledge in the field of reading, processing and presenting statistical data, with particular emphasis on data obtained in a chemical laboratory.

### Course-related learning outcomes

Knowledge:

1. K\_W01 A student has the necessary knowledge of mathematics in terms of the use of mathematical methods to describe the problems and processes of chemistry, and to perform calculations needed in engineering.
2. K\_W15 The student knows the basic methods, techniques, tools and materials used to solve simple tasks in the field of technology and chemical engineering.

#### Skills:

1. K\_U01 The student is able to obtain the necessary information from literature, databases and other sources regarding chemical sciences, properly interprets them, draws conclusions, formulates and justifies opinions.
2. K\_U07 The graduate can use computer programs that support engineering, plan chemical experiments, examine the course of chemical processes and properly interpret the results obtained.
3. K\_U08 The graduate can use mathematical knowledge to simulate, design, optimize and characterize simple chemical processes and unit operations.

#### Social competences:

1. K\_K01 The graduate understands the need to develop and improve their professional, personal and social competences.
2. K\_K02 The student is aware of the importance and understanding of the non-technical aspects and effects of engineering activities, including their impact on the environment and the associated responsibility for the decisions made.
3. K\_K04 The graduate can appropriately determine the priorities for accomplishing the assigned task.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired as part of each subsequent lecture is verified in the form of a multiple-choice test conducted on the eCourses platform within 6 days, starting from the next day after the lecture, preceding the next lecture. The test consists of 10-15 questions (open and closed) scored differently. Passing threshold: 51% of the total number of points. The final grade of the lecture will be issued according to the following criteria: 51%-60% (3,0), 60%-72% (3,5); 72%-85% (4,0), 85%-93% (4,5), 93%-100% (5,0). The issues on the basis of which the questions are developed will be presented to students during the lecture.

The knowledge acquired during the exercises is verified by means of two 60-minute colloquia carried out during 7 and 15 classes. Each colloquium includes a solution of 4 - 5 tasks scored differently. Colloquia will be carried out either in a stationary system or in the form of a test with open questions on the eCourses platform. The credit issues on the basis of which the questions are developed will be passed on to students during the classes.

The final assessment of the exercises will be issued on the basis of the score obtained from the tests from the lectures and the colloquia from the tasks. The share of individual scores in the final assessment will be as follows: lecture test - 40% colloquia from tasks - 60%. Passing threshold: 51% of the total number of points. The final evaluation of the project will be issued according to the following criteria: 51%-60% (3,0), 60%-72% (3,5); 72%-85% (4,0), 85%-93% (4,5), 93%-100% (5,0).

### Programme content

Issues in chemometrics and elements of statistics.

#### Course topics

1. Basic concepts of the probability theory.
2. Random variables.
3. Basic concepts of mathematical statistics (descriptive statistics).
4. Point and interval estimation.
5. Statistical hypothesis.
6. Simple linear regression.
7. Uncertainty of measurements.

#### Teaching methods

Lecture: a multimedia presentation.

Tutorials: solving problems illustrating the various issues.

#### Bibliography

Basic:

1. Kordecki, J., Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GIS, Wrocław 2010.
2. Jasiulewicz, H., Kordecki, J., Rachunek prawdopodobieństwa i statystyka matematyczna. Przykłady i zadania. Oficyna Wydawnicza GIS, Wrocław 2003.
3. John R. Taylor, Wstęp do analizy błędu pomiarowego, Wydawnictwo Naukowe PWN, Warszawa, 1999.

Additional:

1. Krysiński, W., Bartos, J., Dyczka, W., Królikowska, K., Wasilewski, M., Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach. Część I. Rachunek prawdopodobieństwa, Wydawnictwo Naukowe PWN, Warszawa 1997.
2. Krysiński, W., Bartos, J., Dyczka, W., Królikowska, K., Wasilewski, M., Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach. Część II. Statystyka matematyczna, Wydawnictwo Naukowe PWN, Warszawa 1997. 4
3. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying E. Ye, Probability & Statistics for Engineers & Scientists, Global Edition, 9/E, Pearson 2016, 816 pp. ISBN-10: 1292161361 • ISBN -13: 9781292161365.
4. Aviva Petrie, Caroline Sabin, Medical Statistics at a Glance Text and Workbook, Wiley Blackwell, 2013, 288 pp, ISBN: 978-1-118-50335-5.

### Breakdown of average student's workload

|                                                                                                                                         | Hours | ECTS |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| Total workload                                                                                                                          | 50    | 2,00 |
| Classes requiring direct contact with the teacher                                                                                       | 45    | 1,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 5     | 0,50 |