



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Analytical chemistry [N1TCh2>CA]

### Course

Field of study

Chemical Technology

Year/Semester

2/3

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

### Number of hours

Lecture

20

Laboratory classes

30

Other

0

Tutorials

0

Projects/seminars

0

### Number of credit points

6,00

### Coordinators

dr hab. inż. Ewa Stanisław  
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### Lecturers

### Prerequisites

Basic knowledge of inorganic chemistry, apparatus used in the chemical laboratory, mathematical tools used in the chemical calculations. Usage of the basic chemical apparatus and volumetric glassware. Understanding of the need to supplement her/his education and increasing personal and professional competences.

### Course objective

To familiarize Students with the practical use of volumetric techniques and methods used in analytical chemistry. To teach the proper way of conducting (methodology, preparation of standard solutions, titration, weighing, precipitation and filtration, washing, drying) the determinations carried out in the laboratory (acid-base titration, oxidation-reduction titrations, complexometric titration, precipitation techniques) as well as gaining proficiency in analytical calculations. Thus it will boost the Student's confidence in their own skills at performing the analytical procedures.

### Course-related learning outcomes

Knowledge:

1. Student has the necessary knowledge in the field of chemistry for the understanding of phenomena

and processes occurring during the reaction used in analytical chemistry [K\_W03, K\_W11]  
2. Student has the systematic, theoretically founded general knowledge in the field of analytical chemistry [K\_W08]

Skills:

1. Student can gather the necessary information from the literature to conduct the determination of an analyte in the test sample [K\_U01]
2. Student is able to perform basic chemical analysis, interprets the results of analyses and draw appropriate conclusions [K\_U01, K\_U18, K\_U21]
3. Student is able to work both individually and in team during the laboratory work [K\_U02]

Social competences:

1. Student understands the need for self-studying and improvement of their professional competences [K\_K01]
2. Student is aware of the principles of engineering ethics [K\_K02, K\_K05]
3. Student can cooperate and work in a group, taking different roles [K\_K03]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as a part of the lecture is verified during the exam at the end of the semester (carried out in a stationary or remote mode via e-Kursy platform). The exam covers main branches of analytical chemistry (acid-base reactions, redoximetry, complexometry, precipitation and gravimetric analysis). Passing threshold: 55% of points.

Skills acquired as a part of the laboratory exercises are verified on the basis of four final tests (carried out in a stationary or remote mode via e-Kursy platform). Each colloquium consists of 5-8 tasks/questions, differently scored depending on their level of difficulty. Passing threshold: 55% of points.

After each completion of the laboratory exercise, Student is required to make a written report.

### Programme content

Issue related to analytical chemistry.

### Course topics

Practical aspects of analytical chemistry: ionic activity and ionic strength in solutions; strong and weak electrolytes; equilibrium in the acid-base reactions, oxidation-reduction reactions, complexes formation reactions, precipitate formation reactions; volumetric-titration techniques (titration curves, indicators, analytical calculations) and gravimetric analysis techniques:

1. The assessment of risks occurring during the laboratory work
2. Volumetric analysis:
  - acid-base titrations and determinations,
  - oxidation-reduction titrations and determinations,
  - complexometric titrations and determinations,
  - precipitate titrations and determinations.

### Teaching methods

1. Lecture: multimedia presentation, discussion. In special cases, the online form of the lecture is allowed.
2. Laboratory exercises: performing practical exercises (determinations) in accordance with the schedule of the subject and written reports including the appropriate chemical reactions together with mathematical calculations.

### Bibliography

Basic:

1. J. Minczewski, Z. Marczenko, *Chemia analityczna*, t.1 i 2, PWN Warszawa 2007/2020
2. A. Cygański, *Chemiczne metody analizy ilościowej*, WNT Warszawa 2005/2013
3. D.A.Skoog, D.M. West, F.J. Holler, S.R. Crouch, *Podstawy chemii analitycznej*, t.1, WNT Warszawa

2006/2007

4. A. Cygański, B. Ptaszyński, J. Krystek, Obliczenia w chemii analitycznej, WNT Warszawa 2004

Additional:

1. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, PWN, Warszawa 1992/2012

2. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, PWN, Warszawa 2013/2020

3. R. Kellner, J.M. Mermet, M. Otto, H.M. Widmer, Analytical Chemistry, Wiley-VCH, Weinheim, 1998

### Breakdown of average student's workload

|  | Hours | ECTS |
|--|-------|------|
| Total workload   | 150   | 6,00 |
| Classes requiring direct contact with the teacher  | 55    | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/<br>tutorials, preparation for tests/exam, project preparation) | 95    | 4,00 |