

LEARNING MODULE DESCRIPTION (SYLLABUS)

ANALYTICAL CHEMISTRY

I. General Information

1. Module title
Analytical Chemistry
2. Module code
AINE
3. Module type – compulsory or optional
Compulsory
4. Program title
General chemistry
5. Cycle of studies (1st or 2nd cycle of studies or full master's programme)
second cycle of studies
6. Year of studies
first year
7. Terms in which taught (winter/summer term) –
winter semester
8. Type of classes and the number of contact hours
15 hours lectures; 60 hours laboratories
9. Number of ECTS credits
6
10. Name, surname, academic degree/title of the module lecturer/other teaching staff/e-mail
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11. Language of classes
English

II. Detailed information

1. Modules aims
 - Transfer of knowledge in the field of principles of operation of analytical instruments, application of analytical techniques and analytical procedures (sample collection and sample preparation procedures) as well as safety rules in laboratory
 - Skills development in method application and analytical problem solving
 - Prepare for proper interpretation of experimental results
 - Development of writing skills in the range of reports from project laboratory work
 - Skills development in literature searching
2. Pre-requisites in terms of knowledge, skills and social competences (where relevant)
The fundamental knowledge in analytical chemistry and basic safety rules
3. Module learning outcomes in terms of knowledge, skills and social competences and their reference to programme learning outcomes

Learning outcomes symbol*	Upon completion of the course, the student will:	Reference to programme learning outcomes#
AINE_01	explains the construction of analytical instrumentation and indicates the possibility	CHE2_W01, CHE2_W02, CHE2_W04, CHE2_W07,

	of its application	CHE2_U13, CHE2_K01
AINE_02	explains the principles of analytical instrumentation	CHE2_W01, CHE2_W02, CHE2_W07, CHE2_W08
AINE_03	applies the following analytical techniques: IR, UV-Vis, AAS, potentiometry, conductometry, ICP-MS, ICP-OES, HPLC	CHE2_W02, CHE2_W07, CHE2_U02, CHE2_U06, CHE2_U07
AINE_04	applies appropriate analytical techniques depending on the sample type and matrix	CHE2_W07, CHE2_U02, CHE2_U06, CHE2_U07, CHE2_U11
AINE_05	correctly interprets the results of analytical determinations	CHE2_W02, CHE2_W03, CHE2_U02, CHE2_U07, CHE2_U12
AINE_06	writes a report on the analytical determination	CHE2_W03, CHE2_W07, CHE2_U05, CHE2_U07, CHE2_U08
AINE_07	assesses the contribution of self and others in conducted research	CHE2_K04, CHE2_K02, CHE2_U15
AINE_08	applies the principles of occupational health and safety rules in the laboratory	CHE2_W07, CHE2_U15, CHE2_K04

* module code, e.g. KHT_01 (KHT – module code in USOS; stands for Polish “Analiza Instrumentalna” /Analytical Chemistry/)
programme learning outcomes (e.g. K_W01, K_U01, ...); first K stands for programme title symbol in Polish, W for “wiedza” (knowledge) in Polish, U – for “umiejętności” (skills) in Polish, K – for “kompetencje społeczne” (social competences) in Polish
01, 02... - learning outcome number

4. Learning content

Learning content symbol*	Learning content description	Reference to module learning outcomes #
TK_01	Occupational health and safety in the laboratory	AINE_8
TK_02	Basic analytical chemistry	AINE_4
TK_03	UV-Vis spectrometry	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_04	Spectrofluorimetry	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_05	IR spectroscopy	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_06	Atomic absorption spectrometry	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_07	Potentiometry, Conductometry, Voltamperometry	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_08	Inductively Coupled Plasma MS	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_09	Inductively Coupled Plasma OES	AINE_1, AINE_2
TK_10	Gas chromatography	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7, AINE_8
TK_11	Liquid chromatography	AINE_1, AINE_2
TK_12	Ion Chromatography	AINE_1, AINE_2, AINE_3, AINE_5, AINE_6, AINE_7,

		AINE_8
TK_13	Standards and Reference Materials	AINE_4, AINE_5, AINE_6
TK_14	correct interpretation and verification of the measurements results on the basis of relevant statistical calculations	AINE_5, AINE_6

e.g. TK_01, TK_02, ... (TK stands for "treści kształcenia" /learning content/ in Polish)

e.g. AINE_01- module code as in Table in II.3

5. Reading list

- 1) Curreli, G., "Analytical instrumentation", Wiley, Chichester 2000
- 2) Harvey D., Modern analytical chemistry, McGraw-Hill Companies Inc. 2000

6. Information on the use of blended-learning (if relevant):

No possibility

7. Information on where to find course materials

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III. Additional information

1. Reference of learning outcomes and learning content to teaching and learning methods and assessment methods

Symbol of module learning outcome*	Symbol of module learning content#	Methods of teaching and learning	Assessment methods of LO achievement&
AINE_01	TK_3, TK_4, TK_5, TK_6, TK_7, TK_8, TK_9, TK_10, TK_11, TK_12	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)
AINE_02	TK_3, TK_4, TK_5, TK_6, TK_7, TK_8, TK_9, TK_10, TK_11, TK_12	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)
AINE_03	TK_3, TK_4, TK_5, TK_7, TK_8, TK_9, TK_11, TK_12	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)
AINE_04	TK_2, TK_14	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)
AINE_05	TK_3, TK_4, TK_5, TK_7, TK_8, TK_9, TK_11, TK_12, TK_13, TK_14	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)
AINE_06	TK_3, TK_4, TK_5, TK_7, TK_8, TK_9, TK_11, TK_12, TK_13, TK_14	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)
AINE_07	TK_3, TK_4, TK_5, TK_7, TK_8, TK_9, TK_11, TK_12	Lecture, practical class	Knowledge and skills tests during

			laboratories (F); final written exam (S)
AINE_08	TK_1, TK_3, TK_4, TK_5, TK_7, TK_8, TK_9, TK_11, TK_12	Lecture, practical class	Knowledge and skills tests during laboratories (F); final written exam (S)

* e.g. TK_01, TK_02, ... (TK stands for "treści kształcenia" /learning content/ in Polish)

e.g. AINE_01- module code as in Table in II.3

2. Student workload (ECTS credits)

Activity types	Mean number of hours* spent on each activity type
Contact hours with the teacher as specified in the programme	75
Preparation for practical classes	45
Development of results	25
Preparation for exam	30
Total hours	175
Total ECTS credits for the module	6

* Class hours – 1 hour means 45 minutes

#Independent study – examples of activity types: (1) preparation for classes, (2) data analysis, (3) library-based work, (4) writing a class report, (5) exam preparation, etc.

3. Assessment criteria

Laboratories

Before starting the laboratory student should be familiar with the principles of occupational health and safety in the laboratory. This knowledge will be checked before first laboratory (formative assessment).

Before each laboratory the knowledge and skills concerning the current topic will be checked. To start the experiments a student should obtain at least 1.5 point (the scale is from 1.5 to 3). Additional 2 points can be obtained for excellent performance of experiment and for correctness of report with final conclusions. To pass the laboratories of analytical chemistry student should complete at least 9 (of 10) exercises. At the last laboratory, beside of weekly test of knowledge and skills, students will solve the test, which cover the main topics raised on laboratories. The questions will be given in the form of problems to be solved. The maximum points that can be obtained is 5.

According to collected points students will receive:

5.0	47-50 points
4.5	43-46 points
4.0	37-42 points
3.5	31-36 points
3.0	25-30 points
2.0	<25 points

Outdoor activities

The reports prepared will be assessed based on substantive content of the study. Additional research conclusions (given based on available scientific literature) will be additionally evaluated.

Lecture

The exam will be in written form. Minimum 25 points must be obtained to pass the exam (maximum is 50). The final mark will base on points obtained on a written exam as well as on points collected on laboratories. Students will receive the final mark:

5.0	47-50 points
4.5	43-46 points
4.0	37-42 points
3.5	31-36 points
3.0	25-30 points
2.0	<25 points