OBSAH

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD100B/25	**Course title:** Advanced Toxicology
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 1.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: The condition for passing the course is passing the final written work in the last week of the semester. Due to excused absence or FX assessment, the exam can also be taken during the exam period. Course assessment according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - can orientate himself in the toxicological properties of selected inorganic and organic chemicals, drugs, toxins, potential tools of chemical terrorism and food, - can characterize the individual gates of entry of chemical substances into the organism and master the mechanism of their transformations after entering the organism, - has knowledge about the content of legal documents related to the handling of chemical substances and poisons.	
Course contents: 1. Toxicology, history, basic concepts and classification. Environmental toxicology and monitoring of toxic substances, toxic substances in the atmosphere, greenhouse effect, ozonosphere. 2. Toxicity and types of toxic effects. Mutagenic, carcinogenic and teratogenic effects of foreign substances. Poisons and their classification. 3. Toxic substances and their entry into the body (absorption, distribution of substances in the body, excretion of toxic substances, transfer of substances through the cell membrane). Mechanism of transformation of toxic substances in the body. 4. Free radicals and antioxidants. Radicals derived from oxygen, nitrogen and organic substances. 5. Chemistry and toxicology of drugs. Drugs acting on the CNS, autonomic nervous system and myocardium. Local anesthetics, antiseptics and disinfectants. Chemotherapeutics and antibiotics.	

6. Drugs, drug addiction and types of drug addiction.
7. Toxicology of natural products. Toxic metabolites produced by microorganisms.
8. Bacterial toxins and fungal toxins.
9. Secondary metabolites of plants and their toxic effects. Animal poisons.
10. Food toxicology and food additives.
11. Toxicology of selected hazardous industrial chemicals and some modern combat poisons.
12. Hygiene and safety at work with toxic and flammable substances. First aid and treatment of poisoning. Government regulation and decree on the handling of poisons. Competence for work with poisons.

Recommended or required literature:

1. Durdiak, J.: Vybrané kapitoly z toxikológie. KU PF Ružomberok, 2010, 129 s.
2. Melicherčíková, D., Melicherčík, M.: Účinky chemických látok na ľudský organizmus v domácom a prírodnom prostredí, Ružomberok, Verbum, 2011, ISBN 9788080847951
3. Durdiak, J., Glončák, P.: Hrozba nekonvenčného terorizmu 21. storočia. Chemický a nukleárny terorizmus. Ružomberok: Verbum, 2011,. 176 s., ISBN 978-80-8084-794-4
4. Melicherčíková, D., Bellová, R.: Drogy“ život a smrť. Ružomberok, Verbum, 2012.
5. Bellová, R.: Chémia potravín, výživa a zdravie. Ružomberok : Verbum , 2011.

Language of instruction:
Slovak language

Notes:
Total workload: 50 hours
Student independent work: 24 hours, ongoing preparation at home
Contact hours: 26 hours

Course evaluation:
Assessed students in total: 1

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): doc. RNDr. Miroslav Rievaj, PhD., Ing. Jaroslav Durdiak, PhD.

Last modification: 22.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD100S/25	**Course title:** Chemistry and Didactics
Type and range of planned learning activities and teaching methods: **Form of instruction:** **Recommended study range:** **hours weekly:** **hours per semester:** **Teaching method:** on-site	
Credits: 8	**Working load:** 200 hours
Recommended semester/trimester: 3., 4..	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: The state exam can be taken on the regular date specified in the study schedule by a student who, during the study control carried out in the last year of study, fulfilled the obligations set out in the accredited study program and the Study Regulations of the University of Ružomberok. The state exam has the character of a colloquium. The grade will be included in the overall assessment of the state exam. Subject assessment according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - Master the basic concepts, phenomena and relationships of chemical processes, know the basic ideas of scientific theories in natural sciences or chemical sciences. - Can describe and evaluate research and propose a scientific method of solving various chemical problems. - Can integrate knowledge from various chemical disciplines and present it in terms of the functioning of natural science laws. - Master the methodology, epistemology and principles of pedagogical diagnostics of the educational process in chemistry, respecting the individual characteristics of pupils and students. - Is able to independently plan, organize, lead and analyze the educational process at ISCED levels 2 and 3 in profile educational areas and specializations. - Has professional competencies for effective work in the social-scientific, professional-subject, information-communication-technological, academic and managerial context of teaching.	
Course contents:	

Updated theses for the colloquium exam are published on the faculty website no later than the beginning of the summer semester in the given academic year.

Recommended or required literature:
according to the literature of the mandatory profile subjects of the given study program

Language of instruction:
Slovak language

Notes:
Total workload: 200 hours
Student independent work: 200 hours, exam preparation
Contact hours: 0 hours

Course evaluation:
Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s):

Last modification: 23.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD104A/25	**Course title:** Chemistry of Air and Solid Wastes
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture / Seminar **Recommended study range:** **hours weekly:** 2 / 1 **hours per semester:** 26 / 13 **Teaching method:** on-site	
Credits: 3	**Working load:** 75 hours
Recommended semester/trimester: 2.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: In the exam, the student will receive a test of 30 questions. The exam takes place during the exam period. Course evaluation according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - Has knowledge about the impact of chemical substances on individual components of the environment, understands the essence of the process of sustainable development and knows the effects of chemical elements and selected inorganic and organic chemical substances on the human body. - Is able to continuously engage in lifelong learning, maintain contact with the latest trends in his field and continue to further improve his qualifications in the field of pedagogical sciences. Is competent to communicate at a qualified professional level with representatives of other fields and also with the public.	
Course contents: 1. Atmosphere. Physical conditions of the atmosphere. Radiation in the atmosphere. Chemical composition of the atmosphere. Aerosols. Smog. Smoke and smoke plumes. Sources of air pollution. 2. Air pollutants: sulfur, nitrogen, carbon compounds, greenhouse effect. Air hydrocarbons: methane, halogen derivatives, pesticides, freons, ozone depletion. Heavy metals and radioactive substances in the air. Ozone. 3. Dust. Air pollution by industry and transport. 4. Air separation and separation processes. Separation devices. Wet and dry separators.	

5. Absorbers, Adsorbers, Condensers, Oxidation and reduction. Limitation of gaseous emissions. Disposal of exhalations from various industries.
6. Air pollution monitoring. Global, regional and impact monitoring.
7. Unified air control system.
8. Measurements in air monitoring and prediction of the spread of pollutants in the air.
9. Waste classification.
10. Waste disposal methods. Recycling and waste recovery.
11. Low-waste and waste-free technologies and biotechnology.
12. Disposal of solid waste from various industries.
13. Disposal of nuclear waste.

Recommended or required literature:

1. Vysoudil M.: Ochrana ovzduší. Univerzita Palackého 2002
2. Burešová K.: Odpady. MŽP ČR, Brno 1994
3. Tölgyessy J., Dilinger P., Harangozó M.: Jadrová chémia, Bratia Sabovci 2001

Language of instruction:
Slovak language

Notes:
Total workload: 75 hours
Student's independent work: 36 hours, ongoing preparation, exam preparation, ppt creation
Contact hours: 39 hours

Course evaluation:
Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Prof. Ing. Peter Tomčík, PhD., doc. RNDr. Miroslav Rievaj, PhD., doc. Ing. Jaroslav Demko, CSc.

Last modification: 22.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD100A/25	**Course title:** Chemistry of Coordination Compounds
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 1.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: During the semester, there will be two written tests at the exercises, each with a maximum score of 20 points. To participate in the exam, it is necessary to score at least 20 points on the tests. On the final written exam, the student can score a maximum of 60 points. The final assessment will be based on the total number of points scored on the tests and the written exam. Course evaluation according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: Learning outcomes: After completing the course, the student will acquire the following knowledge, skills and competencies: - Has deep, cross-sectional and relevant knowledge of basic chemical disciplines. Has knowledge of current trends in modern chemistry, can assess the reactivity of chemical compounds and the mechanisms of individual types of chemical reactions. - Is skilled in working with professional and scientific literature, can analyze the information obtained, critically evaluate it and then take and defend his own position. - Is prepared to present professional issues in a high-quality manner, applying the latest knowledge from the field of general didactics, but also chemistry didactics. - Is able to continuously engage in lifelong learning, maintain contact with the latest trends in his field and in the field of pedagogical sciences, thus continuing to further improve his qualifications. Is competent to communicate at a qualified professional level with representatives of other fields and also with the public.	
Course contents: 1. Basic concepts of coordination chemistry.	

2. Methodology for naming complex compounds.
3. Coordination geometry, number and arrangement of ligands, coordination numbers 2-9.
4. Formation and nature of coordination bond, analysis of current theories.
5. Spectral properties of complexes, magnetic properties of complexes.
6. Complexes with #- acceptor ligands.
7. Metal carbonyls, complexes with molecular nitrogen.
8. Nitrosyl complexes, cyano complexes.
9. Complexes with salkenes, alkynes, allyl complexes.
10. Stability of complex compounds, complex formation equilibria.
11. Isomerism of complex compounds.
12. Rate and mechanism of reactions of complex compounds.
13. Characteristics of selected complex compounds.

Recommended or required literature:

1. Kurucz, J.: Notes on the theory of coordination compounds. Verbum, Ružomberok 2013.
2. Gažo, J. et al.: General and inorganic chemistry. Bratislava: Alfa, 1981.
3. Březina F., Pastorek R.: Coordination chemistry. UP Olomouc 1991.
4. Cotton F. A., Wilkinson G.: Inorganic chemistry. Academia Praha 1973.

Language of instruction:

Slovak language

Notes:

Total workload: 50 hours
Student independent work: 24 hours, home preparation for the exam and in-person tests
Contact hours: 26 hours

Course evaluation:

Assessed students in total: 1

A	B	C	D	E	FX
0.0	0.0	100.0	0.0	0.0	0.0

Name of lecturer(s): doc. Ing. Eva Culková, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 26.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD109A/25	**Course title:** Continuous teaching practice (Chemistry)
Type and range of planned learning activities and teaching methods: **Form of instruction:** Seminar **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 3.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Over the course of the semester, the student will participate in 1 teacher orientation and complete 19 direct exits at a selected elementary or middle school. During this time, he/she keeps a pedagogical diary in which he/she records the theoretical knowledge imparted in the field of chemistry and the didactic-pedagogical practices of the trainee teacher, as well as his/her own preparations for the lesson. With the trainee teacher, he/she carries out lesson analyses. The trainee teacher gives the student an evaluation which represents 60% of the evaluation. The student's work discipline and behaviour, cooperation with the trainee teacher, educational performance, the student's linguistic expression, interest in learning about the school environment and attitude towards the teaching profession are evaluated. The student also develops a self-reflection protocol from each self-reflection lesson. These documents, as well as the preparation of pedagogical logs and analysis of the lessons with the trainee teacher, serve the practice methodologist for the final evaluation of the student in the 40% range.	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - The student is able to independently prepare a written preparation for a lesson and conduct it independently. - The student is able to navigate generally binding legal, ethical, economic regulations related to the work of a teacher, in pedagogical documentation, in other conceptual and strategic documents of the school. - He/She is able to create methodological materials with wider applicability in connection with practice through e-learning or multimedia aspects. He/She is able to cooperate in solving professional projects in the field of chemistry and didactics. He/She is able to carry out research into pedagogical phenomena, formulate conclusions of the research and present his/her results externally.	
Course contents: - The student will familiarize himself with the documentation required for entry to the training school and - the conditions for completing the internship.	

- The student will familiarize himself with the training school environment and the training teacher, and will establish a plan and schedule for the internship.
- The student will attend 1 chemistry lesson taught by the training teacher at the selected
- primary or secondary school.
- The student will prepare and teach 19 chemistry lessons himself.
- The student will prepare self-reflection protocols after each of his/her assignments.
- The student will analyze the lessons together with the training teacher.
- The student will submit a pedagogical diary prepared according to the requirements of the training teacher and the methodology of the internship.

Recommended or required literature:

1. Bellová, R.: Chapters on general chemistry didactics, Ružomberok, 2010.
2. Gnot, M. et al.: Pedagogical practice: for students of teacher combinations at the Faculty of Natural Sciences, Comenius University. Bratislava: Comenius University, 2003.
3. Bellová, R.: Increasing the effectiveness of chemistry teaching for primary and secondary school students, Ružomberok 2009.
4. Chemistry for primary and secondary schools

Language of instruction:

Notes:

Total student time load: 50 hours, of which: outputs, analysis of teaching hours: 26 hours, own preparation of portfolio and pedagogical diary: 24 hours.

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD.

Last modification: 22.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD103A/25	**Course title:** Continuous teaching practice 1 (Chemistry)
Type and range of planned learning activities and teaching methods: **Form of instruction:** Seminar **Recommended study range:** **hours weekly:** 1 **hours per semester:** 13 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 1.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Over the course of the semester, the student will participate in 1 teacher orientation, 6 student orientations, and complete 3 direct exits at a selected elementary or middle school. During this time, he/she keeps a pedagogical diary in which he/she records the theoretical knowledge imparted in the field of chemistry as well as the didactic-pedagogical practices of the practicing teacher and classmates, as well as his/her own preparations for the lesson. With the trainee teacher, he/she analyses the lessons in which he/she has participated (implementation is done in groups). The trainee teacher gives the student an assessment which represents 60% of the mark. The student draws up a report of each lesson, where he/she evaluates the course of the teaching process. The student will develop a self-reflection log for the self-reflection lessons. These documents, as well as the preparation of pedagogical logs and analysis of the lessons with the trainee teacher, ar	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competences: - The student will be able to observe, analyse and record in the hospital records and pedagogical diaries the pedagogical and psychological aspects of the educational process. - The student is able to orientate himself/herself in generally binding legal, ethical, economic regulations related to the work of a teacher, in pedagogical documentation, in other conceptual and strategic documents of the school. - He/she is proficient in the creation of methodological materials with wider applicability in connection with practice through e-learning or multimedia aspects. He is able to collaborate in solving professional projects in the field of chemistry and didactics. He is able to carry out investigations of pedagogical phenomena, to formulate conclusions of investigations and to present his results externally.	
Course contents:	

- The student is familiarised with the necessary documentation required to enter the training school and
- the conditions for completing the apprenticeship
- The student becomes familiar with the environment of the training school and the trainee teacher, sets the timetable for the practice.
- The student will attend 1 chemistry lesson taught by the trainee teacher at the selected
- primary or secondary school.
- The student will participate in 6 chemistry lessons taught by his/her classmates.
- The student prepares and conducts 3 chemistry lessons on his/her own.
- The student will develop self-reflection protocols after each of his/her outputs.
- The student and the practicum teacher will do a reflection on all lessons.
- The student will hand in a pedagogical diary prepared according to the requirements of the trainee teacher and the practice methodologist.

Recommended or required literature:

1. Bellová, R.: Kapitoly zo všeobecnej didaktiky chémie, Ružomberok, 2010.
2. Gnot, M. et al.: Pedagogical practice : for students of teaching combinations at Prír. For teaching pedagogical methods for teacher education students at the Faculty of Education, Comenius University. Bratislava: Comenius University , 2003.
3. Bellová, R.: Increasing the effectiveness of teaching chemistry to primary and secondary school pupils, Ružomberok 2009.
4. Čapek, R., 2015. Modern didactics : lexicon of teaching and evaluation methods. Prague : Grada, 2015
5. Petlák, E., 2016. General didactics. Bratislava : Iris 3rd ed., 2016
6. Chemistry for primary and secondary schools

Language of instruction:

Notes:
Total time load of the student: 50 hours, of which: outputs, sketches, lesson analysis: 13 hours, own preparation of the portfolio and pedagogical diary: 27 hours, consultations: 10 hours.

Course evaluation:
Assessed students in total: 1

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD.

Last modification: 22.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD106A/25	**Course title:** Continuous teaching practice 2 (Chemistry)
Type and range of planned learning activities and teaching methods: **Form of instruction:** Seminar **Recommended study range:** **hours weekly:** 1 **hours per semester:** 13 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 2.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Over the course of the semester, the student will participate in 1 teacher orientation, 6 student orientations, and complete 3 direct exits at a selected elementary or middle school. During this time, he/she keeps a pedagogical diary in which he/she records the theoretical knowledge imparted in the field of chemistry as well as the didactic-pedagogical practices of the practicing teacher and classmates, as well as his/her own preparations for the lesson. With the trainee teacher, he/she analyses the lessons in which he/she has participated (implementation is done in groups). The trainee teacher gives the student an evaluation, which represents 60% of the evaluation.. The student draws up a protocol of each lesson, where he/she evaluates the course of the teaching process. The student will develop a self-reflection log for the self-reflection lessons. These documents, as well as the preparation of pedagogical logs and analysis of the lessons with the trainee teacher, are used by the Practice Methodologist for the final assessment of the student at 40%.	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competences: - The student will be able to observe, analyse and record in the hospital records and pedagogical diaries the pedagogical and psychological aspects of the educational process. - The student is able to orientate himself/herself in generally binding legal, ethical, economic regulations related to the work of a teacher, in pedagogical documentation, in other conceptual and strategic documents of the school. - He/she is proficient in the creation of methodological materials with wider applicability in connection with practice through e-learning or multimedia aspects. He is able to collaborate in solving professional projects in the field of chemistry and didactics. He is able to carry out investigations of pedagogical phenomena, to formulate conclusions of investigations and to present his results externally.	
Course contents:	

- The student is familiarised with the necessary documentation required to enter the training school and
- the conditions for completing the apprenticeship
- The student becomes familiar with the environment of the training school and the trainee teacher, sets the timetable for the practice.
- The student will attend 1 chemistry lesson taught by the trainee teacher at the selected
- primary or secondary school.
- The student will participate in 6 chemistry lessons taught by his/her classmates.
- The student prepares and conducts 3 chemistry lessons on his/her own.
- The student will develop self-reflection protocols after each of his/her outputs.
- The student and the practicum teacher will do a reflection on all lessons.
- The student will hand in a pedagogical diary prepared according to the requirements of the trainee teacher and the practice methodologist.

Recommended or required literature:

1. Bellová, R.: Kapitoly zo všeobecnej didaktiky chémie, Ružomberok, 2010.
2. Gnot, M. et al.: Pedagogical practice : for students of teaching combinations at Prír. For teaching pedagogical methods for teacher education students at the Faculty of Education, Comenius University. Bratislava: Comenius University , 2003.
3. Bellová, R.: Increasing the effectiveness of teaching chemistry to primary and secondary school pupils, Ružomberok 2009.
4. Čapek, R., 2015. Modern didactics : lexicon of teaching and evaluation methods. Prague : Grada, 2015
5. Petlák, E., 2016. General didactics. Bratislava : Iris 3rd ed., 2016
6. Chemistry for primary and secondary schools

Language of instruction:

Notes:

Total student time burden: 50 hours, of which: outputs, sketches, lesson analyses: 13 hours, own portfolio and pedagogical diary preparation: 27 hours, consultations: 10 hours

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD101C/25	**Course title:** Drugs and Chemical Aspects of Dependencies
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 2.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Conditions for passing the course: Passing the final test at the end of the semester. In case of excused absence or FX assessment, the exam can also be taken during the exam period. The maximum number of points obtained is 50. Evaluation of the course according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will gain the following knowledge, skills and competencies: - Students are able to explain the negative effects of drugs on the human body, drugs on the human body, drugs as a medicine, - They know how to discuss the prevention of drug addiction, conditions, effects and possibilities of detoxification. - They have the prerequisites to use knowledge about the effects of drugs and the development of drug addiction in teaching chemistry in various topics. They are able to discuss the responsibility of society for drug consumption.	
Course contents: 1. A brief overview of drugs in human history. Natural sources of drugs. Drug use in the past and present. Synthetic drugs. Production and distribution of drugs. 2. Drugs in the human body affecting pain, performance, artistic creativity, mood, etc. 3. Drug addiction to alcohol. The influence of age, genetics, frequency of alcohol consumption on alcoholism. The effects of substances in wine and spirits on the human body. 4. Drug addiction to nicotine. Chemical substances in tobacco affecting health. Passive and active smoking.	

5. Drug addiction to cannabinoids and cocaine. Marijuana, a drug or a medicine? Legislation on the cultivation, sale and storage of marijuana in different countries. Detoxification.
6. Addiction to psychostimulants. From amphetamine, through ecstasy to spices, coffee and chocolate. Interesting facts from history. Effect on the human body. Abstinence.
7. Hallucinogen addiction. A rich source of hallucinogens in the plant kingdom. Interesting facts from history. Effect on the human body. Drugs as a medicine in the past and present.
8. Drug addiction to volatile substances. Composition, occurrence and effect on the human body. Restriction on the use of certain chemicals in school experiments.
9. New types of drugs, their source and distribution. Purity of drugs, drug mixtures and their effect on the human body.
10. Overview of drug legislation in the Slovak Republic. Drug situation in Europe and other countries of the world. Anti-drug activities, drug distribution.
11. Various forms of anti-drug prevention and their effectiveness, efficiency. The role of family and society in preventing drug use. School and anti-drug activities.
12. School environment and drug use, distribution. Psychological and physical manifestations after drug use. Attitudes of students towards drug use in different age categories. Presentation of research results in this area.

Recommended or required literature:

1. Melicherčíková, D., Bellová, R.: Drogy – život a smrť. Verbum, Ružomberok 2012.
2. Zehentbauer, J.: Drogy lidského těla. Portál, Praha 2012.
3. Stone, T., Darlingtonová, G.: Léky, drogy, jedy. Académia, Praha 2000.
4. Kolektív autorů občanského združení Sananim: Drogy. Otázky a odpovědi. Portál, Praha 2007.

Language of instruction:

Slovak language

Notes:

Total workload: 50 hours
Student independent work: 24 hours, ongoing preparation at home
Contact hours: 26 hours

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): doc. RNDr. Miroslav Rievaj, PhD., Ing. Jaroslav Durdiak, PhD.

Last modification: 23.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD102B/25	**Course title:** Food Chemistry and Healthy Nutrition
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 2.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Final test covering the entire curriculum with a maximum score of 30 points in the final week of the semester. In case of excused absence or FX assessment, the exam can also be taken during the exam period. Seminar paper during the semester - written evaluation of one's own weekly menu with regard to the requirements of a healthy diet in given living conditions. Course evaluation according to the Rector's directive: A – 100%-93%, B – 92%-85%, C – 84%-77%, D – 76%-69%, E – 68%-60%, Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competences: - Students know the food sources of bioactive substances and are able to explain their effect on the human organism. - They know the factors that influence a healthy diet for an individual and are able to analyze them with an emphasis on factors of physical, mental activity, as well as the environment. - They can explain the positives and negatives of various diets, characterize the factors influencing the absorption of nutrients, know the principles of healthy nutrition, changes in the composition of food during heat treatment, storage, preservation and are able to compile appropriate combinations of foods from the point of view of quality nutrition.	
Course contents: 1. Historical view of nutrition and changes in human nutrition. Basic concepts in nutrition. Physiological needs of man. Psychological and social influences on human nutrition. Energy balance. 2. The human gastrointestinal system and its activity. Physiology of digestion, absorption. Types of diet (carnivorous, omnivorous, vegetarian, macrobiotic, fractional diet, etc.) 3. Macronutrients in nutrition. Chemistry of proteins, carbohydrates, fats, their metabolism. 4. Biogenic elements in food, their absorption, effect, sources. Diseases caused by their deficiency and excess in the body. 5. Vitamins, enzymes and their impact on health. Hypo- and hyper-vitaminosis. Antioxidants in food and their importance for health.	

6. Toxic substances in food. Changes in food quality caused by heat treatment, preservation, storage. Additives.
7. Water in the human body. The most important ions in mineral waters. Drinking regimen. The influence of water and non-alcoholic beverages on health.
8. Principles of proper nutrition. Chemical composition of food. The difference between analytical values and the absorbability of food components. Energy balance.
9. Rational nutrition of children, during pregnancy and lactation. Nutrition in adolescence, in productive and older age. Nutrition, health and disease prevention.
10. Main food sources in human nutrition. Foods of animal and plant origin. Food supplements. Snacks, spices.
11. Health disorders influenced by nutrition. Civilization diseases. Acidification of the body. Overweight, obesity. Metabolic diseases.
12. Nutritional treatment. Fruit and vegetable treatment. The importance of nutrition in the prevention and treatment of diseases of the human body.

Recommended or required literature:

1. Bellová, R.: Food Chemistry, Nutrition and Health. Verbum, Ružomberok 2011.
2. Melicherčíková, D., Melicherčík, M.: Effects of Chemicals on the Human Organism in the Domestic and Natural Environment. Verbum, Ružomberok 2011.
3. Velíšek, J., Hejšlová, J.: Food Chemistry. I. and II. parts. 3rd ed. Ossis, Tábor 2009.
4. Keresteš, J. et al.: Health and Nutrition of People. Nika spol. s r. o., Bratislava 2011.

Language of instruction:

Notes:
Total workload: 50 hours Student's independent work: 24 hours, ongoing preparation at home and preparation of seminar work Contact hours: 26 hours

Course evaluation:
Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): doc. Ing. Eva Culková, PhD., Ing. Jaroslav Durdiak, PhD.

Last modification: 25.09.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD102A/25	**Course title:** General didactics of chemistry
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture / Seminar **Recommended study range:** **hours weekly:** 1 / 1 **hours per semester:** 13 / 13 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 1.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Verification of the degree of acquisition of the relevant knowledge, skills and competences of the student is carried out on the basis of theoretical and practical examinations during the semester teaching of the subject. During the semester, the student demonstrates his/her theoretical knowledge of didactics of chemistry such as the content, forms, methods and procedures of educational activities. Continuous evaluation during the semester: Active participation in seminars. The student prepares and presents seminar papers on specific topics in terms of the course syllabus (50%). The final assessment of the course is in the form of a written examination with a summative percentage of 50% and verification of practical skills from the continuous assessment with a score of 50%. In total, the student may obtain 100 points.	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competences: - knows and masters didactic principles and procedures of educational activity, as well as methods and principles - methods and methods of planning and managing the educational process, - is able to organise, lead and analyse the educational process independently and eruditely, - in the subject of biology and ecology with regard to innovative trends and communicate with the public about - current problems in the field of chemistry, - is capable of critical thinking, is creative and is characterised by flexibility in thinking (adaptability, flexibility, improvisational skills) for pedagogical practice, - can solve problems, coordinate procedures in the educational process and responsibly implement current scientific knowledge in chemistry into practice.	
Course contents: 1. Characteristics of the subject chemistry. Objectives, taxonomy of educational objectives, content and structure of the chemistry curriculum, curriculum, educational standards in chemistry for primary and secondary schools. Basic didactic concepts.	

2. State educational programme ISCED 2, ISCED 3A. Application of educational competences in teaching. Didactic principles in teaching chemistry.
3. Methods and forms of teaching chemistry in transmissive and constructivist, exploratory approaches to teaching. Alternative innovative approaches to education.
4. Didactic means applied in teaching chemistry, teaching aids, ICT, teaching programs.
5. Didactic tests in chemistry, their design, quality measures, optimization of the use of didactic tests.
6. Problem-based, exploratory, heuristic methods in teaching chemistry.
7. Science literacy. Cross-curricular relations of chemistry with science subjects and mathematics. Chemical calculations.
8. Diagnostics and feedback in chemistry teaching. Assessment of learning outcomes and classification of pupils.
9. The importance of motivation in education. Possibilities of presenting new scientific knowledge in chemistry teaching. Relevant sources of information.
10. Long-term and short-term teacher preparation for teaching. Teaching styles.
11. The school chemistry experiment. Demonstration experiments, pupil experiments in chemistry teaching. Thought experiments in chemistry. Real chemical experiment and computer modelled chemical experiment.
In the seminars, assignments and problems are solved on the topics discussed in lectures.

Recommended or required literature:

1. Bellová, R.: Chapters from general didactics of chemistry. Verbum, Ružomberok 2010.
2. Mokrejšová, O.: Modern teaching of chemistry. Tritan, Prague 2009.
3. Skalková, J.: General didactics : teaching process, curriculum and its selection, methods, organizational forms of teaching. Grada, Prague 2007.
4. Kalhous, Z. et al.: School didactics. Portal, Prague 2009.
5. Bellová, R.: Increasing the effectiveness of teaching chemistry to primary and secondary school pupils. Teaching Faculty of the Catholic University of Ružomberok, 2009
6. Held, Ľ., et al., 2011. A research-tuned concept of science education (IBSE in the Slovak context). Trnava: Faculty of Education, University of Trnava, 2011
7. Turek, I., 2002. Increasing the effectiveness of teaching. Bratislava : Methodological Centre in Bratislava, 2002
8. Petlák, E., 2016. General didactics. Bratislava : Iris 3rd ed., 2016
9. Turek, I.: Didactics. Iura Edition, spol. s r. o., Bratislava 2010.
10. Petlák, E.: General didactics. Bratislava: Iris , 2004.

Language of instruction:

Notes:
Total student time load: 50 hours, of which: direct combined teaching (P, C): 26 hours, seminar paper preparation: 10 hours, self-study: 14 hours

Course evaluation:
Assessed students in total: 1

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD107A/25	**Course title:** Mechanisms of Organic Reactions
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture / Seminar **Recommended study range:** **hours weekly:** 1 / 1 **hours per semester:** 13 / 13 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 3.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Conditions for passing the course: There will be three written tests during the exercises, each with a maximum score of 20 points. To participate in the oral exam during the exam period, it is necessary to pass all tests and score at least 35 points. Course evaluation according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - based on knowledge of the structure of individual organic compounds and their disposition to reactions, they can explain the mechanisms of organic reactions. - are able to describe and explain the rules of substitution on saturated carbon and on multiple bonds, the mechanism of aromatic substitutions, addition, elimination reactions and various types of chemical molecules rearrangements.	
Course contents: Brief course outline: 1. Spatial structure of organic molecules. Isomerism, conformations. 2. Factors influencing covalent bonding. Polarity and effects. 3. Causes of chemical processes. Factors influencing the course of chemical reactions. 4. Stability of chemical particles, electrical and steric influences 5. Acid-base reactions 6. Theory of chemical bonding, chemical bond cleavage, types of chemical reactions, carrying out chemical transformations. 7. Reaction mechanisms of selected substitution nucleophilic reactions	

8. Reaction mechanisms of selected electrophilic substitution reactions
9. Reaction mechanisms of selected substitution radical reactions
10. Mechanisms of elimination reactions.
11. Electrophilic, nucleophilic and radical addition reactions.
12. Mechanisms of molecule chemical rearrangements.

Recommended or required literature:

1. Durdiak, J., Tomčík, P.: Organická chémia pre pedagogické fakulty. Vysokoškolská učebnica, Katolícka univerzita v Ružomberku. VERBUM - vydavateľstvo KU, 2018. - 295 s., ISBN 978-80-561-0556-6
2. Pacák, J.: Reakce organických sloučenin. Univerzita Karlova v Praze, Karolinum, 2006
3. Červinka, O. a kol.: Mechanizmy organických reakcí. SNTL Praha 1976.
4. J. Kováč – Š. Kováč: Organická chémia 1, 2. Alfa STNL Bratislava, 1992,

Language of instruction:

Slovak language

Notes:

Total workload: 50 hours
Student independent work: 24 hours, exam preparation at home, presentation preparation
Contact hours: 26 hours

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): doc. Ing. Eva Culková, PhD., Prof. Ing. Peter Tomčík, PhD., Ing. Jaroslav Durdiak, PhD.

Last modification: 22.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD100C/25	**Course title:** Problematic tasks in chemistry education
Type and range of planned learning activities and teaching methods: **Form of instruction:** Seminar **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 1	**Working load:** 25 hours
Recommended semester/trimester: 3.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: During the semester, the student demonstrates his/her theoretical knowledge and practical skills continuously in the form of sub-tasks in the creation of problem problems, where their activity in the exercises will be evaluated (their own proposals of problem problems in chemistry and their interpretation according to the assignment). The student's final assessment will be based on the assessment of the sub-assignments and their ongoing activities during the semester. Translated with DeepL.com (free version)	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competences: - The student will know the possibilities and importance of using problem problems in chemistry teaching in relation to different forms and methods of teaching and at different stages of the teaching process. - The student is able to competently design specific groups of problem problems with regard to the phases of the teaching process and the methods and means used in the different forms of education.	
Course contents: 1. Alternative practices in teaching. 2. The importance and possibilities of using problem tasks for the process of motivation in different stages of the teaching process I. 3. The importance and possibilities of using problem tasks for the process of motivation at different stages of the teaching process II. 4. Possibilities of updating the teaching of chemistry through problem-based tasks. 5. Conditions and possibilities of individual and group problem solving in chemistry. 6. Solution, verification of problem solving through experimental activities (teacher, students) I. 7. Solution, verification of solutions of problem problems through experimental activity (teacher, students) II. 8. The importance of problem problems for the development of science literacy, or reading literacy. 9. Problem tasks and cross-curricular relations, their interdisciplinary character. 10. The use and importance of problem problems in school and out-of-school chemistry education.	

11. Problem problems and ICT.
12. Implementation and presentation of problem-based tasks in the framework of cross-curricular relations.

Recommended or required literature:

1. Melicherčíková, D. et al.: Problematic tasks in chemical education. Ružomberok : Verbum, 2011.
2. Melicherčíková et al.: Interesting experiments in inorganic chemistry. Ružomberok: Verbum, 2018.
3. Turek, I.: Teacher education for the 21st century. Bratislava: Metodické centrum, 2001.
4. Ganajová, M. et al.: Project-based learning in chemistry. State Pedagogical Institute, Bratislava, 2010.
https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/01cast_a_web.pdf
5. Turek, I.: Didactics. Bratislava : Wolters Kluwer, 2014.
6. Mokrejšová, O.: Modern chemistry teaching, Prague: Triton, 2009.
7. Turek, I.: Education in OECD and EU countries. Bratislava: Metodické centrum, 2000.

Language of instruction:
anglicky

Notes:
Total workload: 26 hours
Contact hours: 26 hours

Course evaluation:
Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD110A/25	**Course title:** Selected Chapters on Physical Chemistry
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 4.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: passing a written-oral exam, during the exam period, based on a didactic interpretation of the assigned problem	
Learning outcomes of the course: Learning outcomes: After completing the course, the student will acquire the following knowledge, skills and competencies: - Master the methodological foundations of empirical research in chemical sciences. He/She knows the theoretical and practical connections in physical chemistry, which will enable him/her to design chemistry teaching in the classroom and implement theoretical and practical teaching. - He/She is able to engage in continuous lifelong learning, maintain contact with trends in physical chemistry and thus continue to further improve his/her qualifications. He/She is competent to communicate at a qualified professional level with physical chemists. - He/She is familiar with simple physical models of chemical phenomena, knows how to solve them and qualitatively discuss the consequences resulting from the solution.	
Course contents: 1. Kinetic theory of ideal gas. 2. Flow of liquids. 3. Optical properties of substances. 4. Dipole moment. Refraction. 5. Third law of thermodynamics. Nernst thermal theorem. 6. Debye-Hückel theory of activity coefficients. 7. Colloids. 8. Physical chemistry of surfaces. 9. Adsorption and adsorption isotherm. 10. Diffusion. Fick's laws. 11. Fundamentals of statistical thermodynamics. 12. Modern batteries and fuel cells.	

Recommended or required literature:

1. Novák J. et al.: Physical Chemistry. VSCHT Prague 2008.
2. Reguli J.: Physical Chemistry PF TRUNI. Vedia SAS 2015
3. Atkins, P.W.: Physical Chemistry. Bratislava: STU, 1999. (Translated from English).

Language of instruction:

Notes:

Total workload: 50 hours
Student independent work: 24 hours, preparation at home, preparation of didactic interpretations
Contact hours: 26 hours

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD101A/25	**Course title:** Selected Chapters on Biochemistry
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 1.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: To meet the condition of passing the subject, the student must take 2 interim tests, one in the middle of the semester and one in the last week of the semester, so that it is completed before the exam period. During the exam period, the student can take the exam only in the case of an excused absence or an FX result. The final assessment will be based on the total number of points from the interim tests. Course assessment according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - has knowledge of the most important chemical processes occurring in living systems. - can characterize and explain selected basic metabolic processes of carbohydrates, lipids and nitrogen compounds, especially proteins.	
Course contents: 1. Metabolism. Catabolic and anabolic processes and their mutual relationship and comparison. Functions and phases of catabolism. 2. Chemical processes in living systems. Assimilation, dissimilatory, endergonic and exergonic processes. 3. Oxidation-reduction reactions. Aerobic and anaerobic processes. Enzyme processes. 4. Energy generation in organisms. Formation and importance of acetyl coenzyme A. Macroergic compound ATP. 5. Anabolism of carbohydrates. Photosynthesis and gluconeogenesis. 6. Catabolism of carbohydrates. Digestion of carbohydrates. Glycolysis. 7. Anabolism of lipids. Synthesis of fatty acids. Esterification.	

8. Catabolism of lipids. Digestion of lipids. Beta oxidation of fatty acids.
9. Metabolism of nitrogen compounds.
10. Protein metabolism. Amination and transamination. Proteosynthesis.
11. Protein catabolism. Protein digestion. Deamination of AMA. Urea cycle.
12. Linkage between carbohydrate, lipid and protein metabolism.

Recommended or required literature:

1. Mikušová, K., Kollárová, M.: Princípy biochémie. (v schémach a príkladoch). UK Bratislava, 2008
2. Škárka, B., Ferenčík, M.: Biochémia. Bratislava Alfa, 1992
3. Zahradník, P., Kollárová, M..: Organická chémia a biochémia. Bratislava : Slovenské pedagogické nakladateľstvo, 1997.

Language of instruction:
Slovak language

Notes:
Total workload: 50 hours Contact hours: 26 hours Independent work: 24 hours - preparation of presentations 6 hours, preparation for midterm tests 18 hours.

Course evaluation:
Assessed students in total: 1

A	B	C	D	E	FX
0.0	100.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Jaroslav Durdiak, PhD., doc. RNDr. Jaroslav Timko, PhD.

Last modification: 25.09.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD101B/25	**Course title:** Selected Chapters on Physics
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 1.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: The condition for passing the course is passing the final written work in the last week of the semester. Due to excused absence or FX assessment, the exam can also be taken during the exam period. Course assessment according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - is able to navigate the subject areas of physics, knows the basic relationships that govern selected physical phenomena. - is able to solve simple physical models based on solving separable differential equations. - is competent to interpret physical problems didactically	
Course contents: 1. Electromagnetism. 2. Electric field. 3. Magnetic field. 4. Oscillations and waves. 5. Mechanical and electromagnetic waves. 6. Optics. 7. Special theory of relativity. 8. Fundamentals of the physics of the microworld. 9. Introduction to quantum physics. 10. Physics of the atomic shell 11. Physics of the atomic nucleus. 12. Physics of subnuclear particles.	

Recommended or required literature:

1. Feynmanove prednášky z fyziky 1, ALFA Bratislava, 1980.
2. Krempaský J.: Fyzika, ALFA-SNTL Bratislava, 1987

Language of instruction:

Slovak language

Notes:

Total workload: 50 hours
Student independent work: 24 hours, ongoing preparation at home
Contact hours: 26 hours

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): doc. RNDr. Miroslav Rievaj, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD105A/25	**Course title:** Special didactics of chemistry 1
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture / Seminar / Laboratory practical **Recommended study range:** **hours weekly:** 1 / 1 / 3 **hours per semester:** 13 / 13 / 39 **Teaching method:** on-site	
Credits: 5	**Working load:** 125 hours
Recommended semester/trimester: 2.	
Level of study: II.	
Prerequisities: KCH/Ch-MD102A/25	

Requirements for passing the course:

During the semester, the student demonstrates his/her theoretical knowledge continuously in the form of active participation in exercises and applies his/her knowledge, skills and competences in the development (design) of lessons on selected topics in general and inorganic chemistry, which he/she presents at the same time.

The course includes laboratory exercises where the students' own preparation of demonstration and student experiments on selected chemical topics in general and inorganic chemistry is assessed. Each student independently prepares a portfolio of experiments (demonstration, pupil) on selected topics and independently verifies them during practical exercises. Then, in the form of demonstration experiments, they present them in front of the whole group. Teaching can be done in blocks, according to the distribution of tasks and the number of students.

In order to participate in the final examination, it is necessary to obtain 30% of points in the theoretical part (presentation of simulated lessons) and 30% in the practical part (presentation of LC) during the semester. The final exam is written, which constitutes 40% of the total grade (max. sum of points is 100).

Learning outcomes of the course:

After completing the course, the student will acquire the following knowledge, skills and competences:

- The student is able to carry out a content and didactic analysis of a part of the chemistry curriculum for lower and upper secondary education (ISCED 2, ISCED 3A)
- Formulates specific objectives for teaching chemistry using active verbs
- Is oriented in teaching methods for the development of higher cognitive abilities in the pupil and is able to integrate them into a teaching unit on a specific topic to be covered.
- In laboratory work, he/she is practically proficient in the use of modern laboratory techniques and procedures and methods, which creates conditions for the quality conduct of laboratory exercises and also an interesting, illustrative and motivating presentation of school experiments in the teaching of chemistry.
- The student is skilled in working with professional and scientific literature, can analyse the information obtained, critically evaluate it and subsequently take and defend his/her own position. He/she is prepared to present professional issues in a good way, applying the latest knowledge in the field of general didactics, as well as didactics of chemistry.

- He knows the possibilities and specific ways of using current didactic and computer technology, which creates a prerequisite for promoting the development of information literacy of pupils.
- It has the ability to present the acquired professional knowledge in activating forms and methods in teaching and to develop students' critical thinking in chemistry education, in teaching it respects the needs, interests, emotions, attitudes and opinions of students.

Course contents:

1. Educational and educational objectives, content, structure of the curriculum of general and inorganic chemistry at primary and secondary schools. State and school educational programme. Methods of developing chemical (science) literacy.
2. Personality of a creative teacher and his/her competences in science education.
3. The chemical experiment and the teacher's responsibility for safety in the classroom. Types of school chemical experiments, methodology of preparing lessons with the inclusion of laboratory exercises in teaching. Effective chemical experiments.
4. Didactic interpretation about chemical substances. Chemically pure substances, mixtures, division of mixtures. Exploratory activities in experiments on the separation of mixtures.
5. Didactic interpretation of the thematic unit: Structure of atoms and ions. The nucleus and the electron shell of the atom. Interpretation of the terms nuclide, isotope, ion, electron configuration of the atom.
6. Didactic interpretation of the periodic system of elements. Periodic law. Periodicity of selected properties of elements, atomic radii, electronegativity. Overview of the arrangement of the elements into different systems.
7. Didactical interpretation of the nomenclature of inorganic compounds - oxides, hydrides, halides, sulphides, salts of oxygenic and oxygen-free acids, crystal hydrates, double salts and coordination compounds.
8. Didactical interpretation of the thematic unit Chemical bonding and structure of substances. Ionic, covalent, metallic, hydrogen bonding, intermolecular forces.
9. Didactical interpretation of the course of chemical reactions. Didactical interpretation of the thematic unit types of chemical reactions. Protolytic, redox, precipitation, complex-forming reactions. Possibilities of demonstration and pupil experiments
10. Didactic interpretation of s-element and their inorganic compounds important in everyday life, their properties, uses, effect on living organisms and the environment.
11. Didactic interpretation of p-elements from 13-15 group of PS elements and their inorganic compounds important in everyday life, their properties, use, influence on living organisms and environment.
12. Didactic interpretation of the topic of chemical calculations, implementation of chemical calculations in individual topics within ISCED 2 and 3.

Part of each didactic interpretation is a proposal of possibilities of demonstration experiments for the given topics.

Laboratory exercises:

Organization of laboratory exercises. Laboratory regulations in schools, occupational safety, storage of chemicals in schools. Glass work for primary and secondary school pupils.
- Didactical analysis and demonstration of experiments on selected topics in general and inorganic chemistry: mixtures and methods of separation of mixtures.
- Practical implementation of demonstration lessons of laboratory exercises and lessons with the inclusion of demonstration chemical experiments in the classroom.
- Didactical analysis and demonstration of experiments on selected topics in general and inorganic chemistry: different types of chemical reactions, kinetics of chemical reactions.
- Didactical analysis and demonstration of experiments on selected topics in general and inorganic chemistry: recognition of chemical elements PSP.

- Didactic analysis and demonstration of experiments on selected topics in chemistry: analytical and physical methods of identification and determination of chemical substances.
- Practical implementation of demonstration lessons of laboratory exercises and lessons with the inclusion of pupils' chemical experiments in the classroom.
- Evaluation of demonstration lessons, methods of assessment and self-assessment.

Recommended or required literature:

1. Bellová, R.: Kapitoly zo všeobecnej didaktiky chémie, Ružomberok 2010.
2. Melicherčík, M., Melicherčíková, D.: Influence of the environment and effects of substances on the human organism. FPV UMB, Banská Bystrica 2010.
3. Šima, J. et al.: Inorganic Chemistry.
4. Melicherčíková, D., Bellová, R.: Problematic tasks in chemical education. Verbum, Ružomberok 2011.
5. Melicherčíková, D. et al. Inorganic and Bioinorganic Chemistry for Teachers, Verbum - Catholic University of Ružomberok, 2019
6. Bellová, R.: Increasing the effectiveness of teaching chemistry to primary and secondary school students. Teacher Training in Chemistry, Teaching and Curriculum Development, Faculty of Education, Catholic University of Ružomberok, 2009
7. Melicherčíková, D. et al.: Interesting experiments in inorganic chemistry, Verbum - Catholic University in Ružomberok, 2018
8. Mokrejšová, O.: Modern chemistry teaching. Modern Modern Chemistry of Chemistry: Triton, 2009.
9. Bellová, R.: Chemical experiments in teaching. Ružomberok, 2011.
10. Kurucz, J., Bellová, R.: Laboratory exercises from all sciences. and inorganic chemistry, KU Ružomberok, 2006.
11. Bartal, M. et al.: Safety at work with chemical agents in primary and secondary schools, 2012.
12. Durdiak, J., Bellová, R.: Laboratory technology, KU Ružomberok, 2005.
13. Bellová, R.: Who knows, let him teach Educational material VII [electronic document] [didactic manual]: Ruzomberok (Slovakia) : Katolícka univerzita v Ružomberku. VERBUM - KU Publishing House, 2023 [online].
14. 14. Textbook of chemistry for primary and secondary schools

Language of instruction:

Notes:
Total student time load: 125 hours, of which: direct combined study (P, C, LC): 65 hours, preparation of simulated lessons for presentation: 20 hours, preparation of a portfolio of school experiments: 20 hours, self-study: 20 hours.

Course evaluation:
Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD., doc. Ing. Eva Culková, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):
People responsible for the delivery, development and quality of the study programme:
Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD108A/25	**Course title:** Special didactics of chemistry 2
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture / Seminar / Laboratory practical **Recommended study range:** **hours weekly:** 1 / 1 / 3 **hours per semester:** 13 / 13 / 39 **Teaching method:** on-site	
Credits: 5	**Working load:** 125 hours
Recommended semester/trimester: 3.	
Level of study: II.	
Prerequisities: KCH/Ch-MD105A/25	

Requirements for passing the course:

During the semester, the student demonstrates his/her theoretical knowledge continuously in the form of active participation in exercises and applies his/her knowledge, skills and competences in the development (design) of lessons on selected topics in organic chemistry and biochemistry, which he/she presents at the same time.

The course includes laboratory exercises where the students' own preparation of demonstration and student experiments on selected topics in organic chemistry and biochemistry is assessed. Each student prepares a portfolio of experiments (demonstration, pupil) on selected topics and independently verifies them during practical exercises. Then, in the form of demonstration experiments, they present them in front of the whole group. Teaching can be done in blocks, according to the distribution of tasks and the number of students.

In order to participate in the final examination, it is necessary to obtain 30% of points in the theoretical part (presentation of simulated lessons) and 30% in the practical part (presentation of LC) during the semester. The final exam is written, which constitutes 40% of the total grade.

Learning outcomes of the course:

After completing the course, the student will acquire the following knowledge, skills and competences:

- Knows the methodological foundations of empirical research in pedagogical sciences and chemical sciences. He/she knows the theoretical and practical contexts in the didactics of the individual disciplines of chemistry, which will enable him/her to design chemistry teaching in the school classroom and to implement theoretical and practical teaching.
- In laboratory work, he/she practically masters the use of modern laboratory equipment and procedures and methods, which creates conditions for the quality of laboratory exercises and also an interesting, illustrative and motivating presentation of school experiments in the teaching of chemistry.
- The student is skilled in working with professional and scientific literature, can analyse the information obtained, critically evaluate it and subsequently take and defend his/her own position. He/she is prepared to present professional issues in a good way, applying the latest knowledge in the field of general didactics, as well as didactics of chemistry.

- He knows the possibilities and specific ways of using current didactic and computer technology, which creates a prerequisite for promoting the development of information literacy of pupils.

Course contents:

1. Educational and educational objectives, content, structure of organic chemistry and biochemistry curriculum at primary and secondary schools. State and school educational programme. Development of competences resulting from the curriculum and possibilities of developing chemical (science) literacy.
2. Didactic interpretation of the thematic unit - Characteristics and distribution of organic substances and basics of their nomenclature. Bonding, structure, isomerism, reactions of organic compounds (substitution, addition, elimination, shear). Hydrocarbons, derivatives of hydrocarbons.
3. Didactic interpretation of the thematic unit - Hydrocarbons important in everyday life, their properties, uses, sources and their impact on living organisms and the environment (CH4 and climate change). Aliphatic, aromatic hydrocarbons. Sources of hydrocarbons (coal, oil, natural gas). Experiments suitable for understanding and consolidation of learning.
4. Didactical interpretation of the thematic unit - Hydrocarbon derivatives important in everyday life, their properties, uses, sources and their impact on living organisms and the environment. Chloroform, iodoform, PVC, polychlorinated biphenyls, DDT, CFCs, insecticides.
5. Didactical interpretation of the thematic unit - Oxygen derivatives of hydrocarbons important in everyday life, their properties, uses, sources and their impact on living organisms and the environment. Alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids.
6. Didactical interpretation of the thematic unit - Nitrogen derivatives of hydrocarbons important in everyday life, their properties, uses, sources and their impact on living organisms and the environment. Aminoderivatives, nitro derivatives.
7. Didactical interpretation of the thematic unit - Lipids, simple and complex. Fats, oils, waxes, solidification of fats, saponification of fats. Phospholipids, glycolipids, cholesterol, ω-fatty acids. Their properties, uses, sources and effects on the human body and the environment. Their metabolism and energy value.
8. Didactic interpretation of the thematic unit - Carbohydrates, division of carbohydrates, chirality, D-, L- forms, optical isomerism, glycaemia, photosynthesis, cellular respiration, metabolism. Importance for humans, composition of honey, sweeteners. Energy value of carbohydrates. Attempts to consolidate knowledge of the properties of carbohydrates.
9. Didactical interpretation of the thematic unit - Proteins. Their biological function, metabolism. Peptide binding, biuret reaction, protein structure, denaturation, lipoproteins, glycoproteins, phosphoproteins, haemoglobin, myoglobin, antibodies, energy value of proteins. Protein denaturation experiments.
10. Didactical interpretation of the thematic unit - Enzymes. General properties, occurrence, importance, biocatalyst. Factors influencing the rate of enzymatic reaction. Comparison of competitive and non-competitive inhibition.
11. Didactical interpretation of the thematic unit - Nucleic acids, classification, composition, occurrence, meaning. Genetic information, DNA, RNA, mediator, transfer, ribosomal RNA, complementarity, codome, anticodome, ATP, macroergic binding.
12. Didactic interpretation of the thematic unit - Vitamins, division of vitamins in terms of importance, composition, solubility in fats and water. Hyper-, hypo-vitaminosis. Characterize retinol, calciferol, tocopherol, thiamine, riboflavin, niacin, pyridoxine, pantothenic acid, folic acid, biotin, ascorbic acid in terms of their occurrence, importance and their function in the human body. Antioxidants.

Laboratory exercises:

- Organization of laboratory exercises, laboratory rules, work safety, laboratory technique.
- Chemistry experiment and teacher's responsibility for safety in the classroom.

- Didactical analysis and demonstration of experiments on selected topics in organic chemistry.
- Didactical analysis and demonstration of experiments on selected topics in biochemistry.
- Use of work with models of organic compounds, properties of macromolecular substances.
- Didactic analysis and demonstration of experiments on selected topics in chemistry: physical and chemical properties of lipids.
- Didactic analysis and demonstration of experiments on selected topics in chemistry: physical and chemical properties of proteins.
- Didactical analysis and demonstration of experiments on selected topics in chemistry: physical and chemical properties of carbohydrates.
- Didactical analysis and demonstration of experiments on selected topics in chemistry: chemical composition of living systems.
- Practical implementation of demonstration lessons of laboratory exercises and lessons in organic chemistry with the inclusion of demonstration chemical experiments in the classroom.
- Practical implementation of demonstration lessons of laboratory exercises and lessons in organic chemistry with the inclusion of student chemical experiments in the classroom.
- Evaluation of demonstration lessons, methods of assessment and self-assessment.

Recommended or required literature:

1. Bellová, R.: Kapitoly zo všeobecnej didaktiky chémie, Ružomberok 2010.
2. Melicherčík, M., Melicherčíková, D.: Influence of the environment and effects of substances on the human organism. FPV UMB, Banská Bystrica 2010
3. Melicherčíková, D. et al. Verbum, Ružombero,k 2011.
4. Zahradník, P. et al.: Organic Chemistry. Bratislava: Comenius University, 2015.
5. Hrnčiar, P.: Organic Chemistry. SPN, Bratislava, 1990.
6. Ferenčík, M., Škárka, B., Novák, M., Turecký, L.: Biochemistry. Slovak Academic Press s r. o., Bratislava 2000
7. Bellová, R.: Chemical experiments in teaching, Ružomberok 2011
8. Bartal, M. et al.: Safety at work with chemical agents in primary and secondary schools, 2012.
9. Melicherčíková, D. et al. Inorganic and Bioinorganic Chemistry for Teachers, Verbum - Katolícka univerzita v Ružomberku, 2019
10. Prokša, M.: Didactic interpretation of the textbook Chemistry 9 laboratory work.Bratislava: Metodicko-pedagogické centrum, 2004.
11. Durdiak, J., Bellová, R.: Laboratory Technology, KU Ružomberok, 2005
Chemistry textbooks for primary and secondary schools.

Language of instruction:

Notes:

Total student time load: 125 hours, of which: direct combined study (P, C, LC): 65 hours, preparation of simulated lessons for presentation: 20 hours, preparation of portfolio of school experiments: 20 hours, self-study: 20 hours.

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): Ing. Renata Bellová, PhD., doc. Ing. Eva Culková, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

Supervisor(s):

People responsible for the delivery, development and quality of the study programme:

Ing. Renata Bellová, PhD., Prof. Ing. Peter Tomčík, PhD.

COURSE INFORMATION SHEET

University: Catholic University in Ružomberok	
Faculty: Faculty of Education	
Course code: KCH/Ch-MD103B/25	**Course title:** The Basics of Instrumental Analysis
Type and range of planned learning activities and teaching methods: **Form of instruction:** Lecture **Recommended study range:** **hours weekly:** 2 **hours per semester:** 26 **Teaching method:** on-site	
Credits: 2	**Working load:** 50 hours
Recommended semester/trimester: 2.	
Level of study: II.	
Prerequisities:	
Requirements for passing the course: Passing a written test at the end of the semester min 45b/75b. In case of excused absence or FX assessment, the exam can also be taken during the exam period. Course evaluation according to the Rector's directive: A – 100%-93% B – 92%-85% C – 84%-77% D – 76%-69% E – 68%-60% Fx – 59%- 0%	
Learning outcomes of the course: After completing the course, the student will acquire the following knowledge, skills and competencies: - knows the principles of separation, optical and electrochemical methods of analytical chemistry - knows how to navigate the applicability of instrumental analytical methods - knows the problems solved by analytical chemistry in the fields of environment, food control , healthcare and pharmacy.	
Course contents: 1. Chromatographic methods and their classification. 2. Adsorption, partition, gel, bioaffinity, ion exchange chromatography. 3. Chromatography with planar experimental arrangement. 4. Gas and liquid chromatography. Elution characteristics. Gradient and isocratic elution. Theoretical models of chromatography. Chromatographic detectors. 5. Electromigration methods. Electrophoresis and isotachophoresis. 6. Potentiometry, Polarography. Voltammetry,.Coulometry. 7. Properties of electromagnetic radiation. 8. Atomic absorption and emission spectrometry. 9. Fluorescence spectrometry,.Molecular spectrometry. UV/VIS absorption spectrometry. Luminescence analysis. Infrared spectroscopy. Raman spectroscopy. 10. Nuclear magnetic resonance.	

11.Refractometry and interferometry. Polarimetry. Optical rotational dispersion. Circular dichroism. Turbidimetry and nephelometry.
12.Mass spectrometry and related methods of substance identification.

Recommended or required literature:

Odporúčaná literatúra:
1. Labuda J., Špánik I., Tarapčík P., Hrouzková S., Vrábel V., Benická E., Hroboňová K., Sádecká J., Beinrohr E., Liptaj T.: Analytická chémia. STU Bratislava 2014, 2020 (kniha)
2. Garaj J., Bustin D., Hladký Z.: Analytická chémia. ALFA Bratislava 1987.

Language of instruction:

Slovak language

Notes:

Total workload: 50 hours
Student independent work: 24 hours, preparation at home
Contact hours: 26 hours

Course evaluation:

Assessed students in total: 0

A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0

Name of lecturer(s): doc. Ing. Eva Culková, PhD., Prof. Ing. Peter Tomčík, PhD.

Last modification: 22.05.2025

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