CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ AMCU/15	**Course name:** Activating teaching methods in chemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 2 **Per study period:** 28 / 28
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚCHV/SPC1a/03

Conditions for course completion:
1. Participations in seminars (also applies to the online form of teaching). Students are required to participate in seminars. The students can excuse themself (incapacity for work, family reasons, etc.) for a maximum of two seminars during the semester without the need for replacement. In the case of a longer-term justified absence (for example due to incapacity for work), the student will be assigned an alternative form of completing the missed curriculum.
2. Active participation in class. Seminars are conducted in a form in which students are active – students present assignments, which include worksheets. The student is obliged to prepare 5 written assignments. The assignments will be available through the e-learning portal LMS Moodle (direct link to the website: https://lms.upjs.sk/) in the course Activating teaching methods in chemistry (ÚCHV/AMCU/15).
3. The content of the seminars also includes assignment in a form of seminar work, which the student submits to the course (ÚCHV/AMCU/15). The seminar work will focus on: Suggestion of an activity on a selected topic for active inquiry (inquiry-based learning, project based learning, use of digital technologies) with a focus on the development of specific scientific and digital skills and skills related to learning. The design of the activity will also include the design of summative and formative assessment tools to verify understanding and skills in the topic.
4. The final presentation of the seminar work. Assessment of the presentation skills. (0 - 20 points). The final presentation will form a comprehensive output of acquired knowledge and skills.
The final evaluation in the course consists of the sum of points obtained for:
1. Assignments during the semester 5x (0 - 50 points)
2. Seminar work (0 - 30 points)
3. Final presentation of the seminar paper (0 - 20 points)
Classification level:
A = 90-100 points
B = 80-90 points
C = 70-80 points
D = 60-70 points
E = 50-60 points
FX = 0-50 points

Learning outcomes:

Students will gain an overview of selected activating methods in teaching chemistry from a theoretical and practical point of view. They can design project work, include it in teaching and evaluate its outcomes. They will be able to design inquiry-based activities, include them in teaching and verify their effectiveness based on formative assessment tools. Students will gain knowledge about the requirements of assessment in the 21st century with a focus on the development and validation of conceptual understanding and skills through the tools of summative and formative assessment. They will learn how to create tasks at different levels of Bloom's taxonomy. They will get acquainted with selected cognitive and metacognitive tools of formative assessment as well as with specific examples. They will know and practically use applications usable for online assessment purposes (Google Forms, Socrative, Kahoot, etc.). Students will acquire skills for the implementation of teaching with computer-based experiments in terms of work procedures, working with technology and organization of work.

Brief outline of the course:

1. Characteristics of activating methods in chemistry teaching.
2. Project-based method in chemistry teaching, characteristics and examples of project work.
3. Inquiry-based methods in chemistry teaching, examples of inquiry-based activities.
4. Requirements for assessment in the 21st century.
5. Assessment in chemistry teaching - Summative assessment. Bloom's taxonomy.
6. Assessment in chemistry teaching - Formative assessment.
7. Applications usable for online assessment purposes (Google Forms, Socrative, Kahoot, etc.).
8. Computer-based chemical experiments.

Recommended literature:

1. GANAJOVÁ, M.: Metodika tvorby učebných úloh a didaktických testov pre chémiu. Košice: UPJŠ, 2015. ISBN 978-80-8152-237-6. https://unibook.upjs.sk/img/cms/2015/pf/didaktika-texty-ganajova.pdf
2. GANAJOVÁ, M., BRESTENSKÁ, B., GUNIŠ, J., JEŠKOVÁ, Z., KIREŠ, M., LEŠKOVÁ, A., LUKÁČ, S., OROSOVÁ, R., SOTÁKOVÁ, I., SZARKA, K., ŠNAJDER, Ľ.: Formatívne hodnotenie vo výučbe prírodných vied, matematiky a informatiky. 1. vyd. UPJŠ v Košiciach, 2021, 450 s. ISBN 978-80-8152-973-3.
3. Inovovaný štátny vzdelávací program pre 2. stupeň ZŠ. Človek a príroda. Chémia. http://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_nsv_2014.pdf
4. Inovovaný štátny vzdelávací program pre gymnázia so štvorročným a päťročným vzdelávacím programom. Človek a príroda. Chémia. http://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_g_4_5_r.pdf
5. Učebnice chémie pre základné školy a gymnáziá.
6. KIREŠ, M., JEŠKOVÁ, Z., GANAJOVÁ, M., KIMÁKOVÁ, K.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť A. Bratislava: ŠPÚ, 2016. http://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/01cast_a_web.pdf
7. GANAJOVÁ, M., KRISTOFOVÁ, M.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť B. Ukážky vytvorených metodických a pracovných materiálov z predmetu Chémia. Bratislava: ŠPÚ, 2016. http://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/04cast_b_chemia_web.pdf
8. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre základné školy. Bratislava: CVTI SR, 2020.

https://vzdelavanie.itakademia.sk/vystupy/zim-che-zs.pdf
9. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre stredné školy. Bratislava: CVTI SR, 2020. https://vzdelavanie.itakademia.sk/vystupy/zim-che-ss.pdf
10. GANAJOVÁ a kol.: Rozvíjanie kompetencií žiakov prostredníctvom učebných úloh z chémie. Bratislava: ŠPÚ, 2018. https://www.statpedu.sk/files/sk/publikacna-cinnost/publikacie/spu-chemia-2018-web.pdf
11. Školský informačný systém. Chémia. http://kekule.science.upjs.sk/chemia/index.htm
12. GANAJOVÁ, M. KALAFUTOVÁ, J. a kol.: Projektové vyučovanie v chémii. Didaktická príručka pre učiteľov základných škôl. Bratislava: Štátny pedagogický ústav, 2010. 144 s. ISBN 978-80-8118-058-3.
13. E – learning kurz: Aktivizujúce metódy výučby chémie (ÚCHV/AMCU/15), https://lms.upjs.sk/

Course language:

Notes:

Course assessment
Total number of assessed students: 48

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

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.

Date of last modification: 25.10.2021

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ ZTOX/04	**Course name:** Basic Toxicology
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 1 **Per study period:** 28 / 14 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 1.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes: In this course, students will learn how important it is in a teacher's job to know the toxicity and physicochemical properties of the substances they work with. They will gain knowledge especially about the specific and systemic toxicity of substances, they will get acquainted with the classification of xenobiotics and with the methods of their effect and possible identification. They will also be familiar with the risks involved in working with a given chemical, from simple metals, oxides to salts. The very important knowledge that will be the result of education is that they will learn how to work and how to handle dangerous substances and ways to protect themselves and students for whom working with these substances is intended. An inseparable part of education is also the knowledge of current Slovak and European chemical legislation, which is dynamic and changes depending on new knowledge in the field of xenobiotic toxicity.	
Brief outline of the course: Historical aspects, types of toxic substances, types of exposure, dose-response relationship. Disposition of toxic compounds (absorption, distribution, excretion of toxic compounds). Metabolism of toxic compounds. Drugs as toxic substances, food additives and contaminants, environmental pollutans. Statement of chemistry laboratory policy. Safe and handling of toxic substances.	
Recommended literature: G. F. Fuhrman: Allgemeine Toxikologie fuer Chemiker, Teubner Verlag, Stutgart 1984. V. E. Forbes, T. L. Forbe: Ecotoxicology in Theory and Practice, Chapman&Hall, London 1994. J. A. Timbrell: Introduction to Toxicology, Taylor&Francis, London 1994. J.H.Duffus, H.G.J. Worth: Fundamental toxicology, RSC Publishing, Cambridge, 2006.	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 325

A	B	C	D	E	FX
21.23	28.0	24.92	17.23	7.38	1.23

Provides: RNDr. Miroslava Matiková Maľarová, PhD.

Date of last modification: 21.06.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ BTC/03	**Course name:** Biotechnology

Course type, scope and the method:
Course type: Lecture
Recommended course-load (hours):
Per week: 3 **Per study period:** 42
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Written test, from which the student must obtain at least 51%.

Learning outcomes:
Students will have knowledge of basic biotechnological processes and their applications in industry, agriculture, food production and medicine.

Brief outline of the course:
Classification of biotechnology, disciplines and subjects which are involved with biotechnology. The fermentation processes, types of bioreactors, impellers, principles of microbial growth, media and substrates for fermentation processes. The bioremediation, production and application of biogas, in-vessel composting. Micro-organisms used to preparation amino acids, their fermentation preparation, isolation and possible uses. The methods of classical Plant Biotechnology. Ethanol fermentation, spirits, production of wine and beer. The biological filters, nutrient removal and the membrane bioreactors. Antibiotics.

Recommended literature:
E.M.T. El-Mansi et al. ,Fermentation microbiology ang biotechnology,second edition, 2007
Y.H. Hui, Food biochemistry & food processing,Blackwell Publishing 2006
J.E. Smith, Biotechnology, Cambridge university press 2009

Course language:

Notes:

Course assessment
Total number of assessed students: 118

A	B	C	D	E	FX
50.85	19.49	16.95	7.63	5.08	0.0

Provides: RNDr. Danica Sabolová, PhD.

Date of last modification: 17.08.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ ZCVU/04	**Course name:** Chemical Engineering

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2., 4.

Course level: I., II., III.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:
General and Inorganic Engineering; Mineral raw materials; Raw materials processing, transport and holding; Chemical reactors; Chemical metallurgy – Fe, Al, Cu working; Inorganic acids manufacture (H2SO4, HNO3, HCl, HF, H3PO4); Industrial electrochemistry; Industrial fertilizers; Silicate industry – cement manufacture, ceramics; Petrochemistry

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 22

A	B	C	D	E	FX	N	P
22.73	54.55	13.64	4.55	0.0	0.0	0.0	4.55

Provides: doc. RNDr. Zuzana Vargová, Ph.D.

Date of last modification: 21.01.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ CHE2/03	**Course name:** Chemical Excursion

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 1t
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 109

A	B	C	D	E	FX
87.16	12.84	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Zuzana Vargová, Ph.D.

Date of last modification: 28.10.2021

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/MSSU1/14	**Course name:** Chemistry and Didactics of Chemistry I

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: II.

Prerequisities: ÚCHV/DCH1/15 and ÚCHV/VKAU/04

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 115

A	B	C	D	E	FX
57.39	26.09	13.91	2.61	0.0	0.0

Provides:

Date of last modification:

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/MSSU2/14	**Course name:** Chemistry and Didactics of Chemistry II

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: II.

Prerequisities: ÚCHV/DCH2/15 and ÚCHV/VKOCH/03

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 45

A	B	C	D	E	FX
77.78	13.33	6.67	2.22	0.0	0.0

Provides:

Date of last modification: 08.02.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/MPPc/15	**Course name:** Continuous practice teaching I

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 4t
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities: ÚCHV/MPPb/15 and ÚCHV/DCH1/22 or ÚCHV/DCH1/15

Conditions for course completion:
1. Compulsory attendance during the organisational and informational seminar.
2. Compulsory attendance: sitting in on classes, analytical classes at training schools.
3. Sitting in on classes and analytical classes with supervising teachers – 6x.
4. Teaching classes and analytical classes under supervision – 18x.
5. Submitted Continued practice teaching (CPT) I documentation.
(Sitting-in records, Written class preparations, List of sitting-in sessions and trainee's performance during CPT I, CPT I report, Assessment of the trainee's pedagogical performance during CPT).

Learning outcomes:
The student can plan lessons and teach them. Present their own psychodidactic and subject-specific didactic concepts of teaching in the environment of a real school classroom. Apply the didactic skills developed during the previous observation of teaching in practice to teach chemistry. Evaluate one's own lesson project and professional competence level (areas: student, educational process, professional development) in terms of pedagogic theory and assessment provided by the supervising teacher.

Brief outline of the course:
Observation and analysis of chemistry lessons and teaching under the supervision of the supervising teacher. Written class preparation and teaching, active participation in extracurricular activities. Didactic Continued practice teaching I analysis.

Recommended literature:
Current chemistry textbooks for primary and secondary schools in the Slovak Republic.

Course language:

Notes:

Course assessment
Total number of assessed students: 152

abs	n
100.0	0.0

Provides: RNDr. Ivana Sotáková, Ph.D., doc. RNDr. Mária Ganajová, CSc.
Date of last modification: 26.10.2021
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ MPPd/15	**Course name:** Continuous practice teaching II
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week: Per study period:** 6t **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 4.	
Course level: II.	
Prerequisities: ÚCHV/MPPc/15 and ÚCHV/DCH2/22	
Conditions for course completion: 1. Compulsory attendance during the organisational and informational seminar. 2. Compulsory attendance: sitting in on classes, analytical classes at training schools. 3. Complete 8 lessons: sitting in on classes and analytical classes with supervising teachers. 4. Teaching classes and analytical classes under supervision – 30x. 5. Submit Continued practice teaching (CPT) II documentation. (Trainee's sitting-in and teaching schedule, Sitting-in records, Written class preparations, List of sitting-in sessions and trainee's performance during CPT II, CPT II report, Assessment of the trainee's pedagogical performance during CPT).	
Learning outcomes: The student can plan a series of lessons and other forms of instruction and teach them continually. Apply the pedagogic as well as subject-specific theory in practical teaching. Apply the didactic skills developed during the previous teaching practice completed in the actual educational environment. Evaluate one's own lesson project and professional competence level (areas: student, educational process, professional development) in terms of pedagogic theory and evaluation provided by the supervising teacher.	
Brief outline of the course: Observation and analysis of chemistry lessons and teaching under supervision. Written class preparation and teaching, active participation in extracurricular activities. Didactic Continued practice teaching (CPT) II analysis.	
Recommended literature: Current chemistry textbooks for primary and secondary schools in the Slovak Republic.	
Course language:	
Notes:	

Course assessment Total number of assessed students: 131	
abs	n
100.0	0.0
Provides: RNDr. Ivana Sotáková, Ph.D., doc. RNDr. Mária Ganajová, CSc.	
Date of last modification: 17.11.2021	
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ KC/03	**Course name:** Cosmetic chemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Seminar written report on the selected topic of this subject and its oral presentation connected with the discussion. Terminal examination by the written form. The corresponding written part is evaluated as follows: 100-91% of points = A, 90-81% of points = B, 80- 71% of points = C, 70-61% = D, 60-51% of points = E, 50% and less = FX. A student must obtain at least 51% of points.

Learning outcomes:
The basic chemical ingredients in cosmetic products, their isolation from natural sources. The construction of some interesting groups of the orgnaic structures and their application in cosmetic industry.

Brief outline of the course:
Skin and its components. The chemistry of lipids. Lipids, their classification (triacylglycerols, glycerophospholipids and sfingophoslipids), liposomes as transport systems. Fatty acids and alcohols, natural and synthetic waxes. Surfactants, their classification. Antioxidants. Dyes, their classification, organic and inorganic dyes, natural and synthetic. Biological active compounds (amino acids, peptides, proteins hydroxy acids, vitamins, polysaccharides) as the cosmetic ingredients. The chemistry of fragrances. Compounds derived from shikimic acid and mevalonic acid, their biosynthesis, Synthetic fragrances and their construction.

Recommended literature:
1. S. V. Bhat, B. A. Nagasampagi, M. Sivakumar: Chemistry of Natural Products, Springer Narosa 2005, ISBN 81-7319-481-5.
2. G. Ohloff: Scent and Fragrances, Springer-Verlag Berlín Heidelberg 1994, ISBN 3-540-57108-6.
3. D. H. Pybus, CH. S. Sell: The chemistry of fragrances, Royal Society of Chemistry 1999, ISBN 0-8540-528-7.
4. Pybus, D. H., Sell, C. S.: The chemistry of fragrances, The Royal Society of Chemistry 1999 UK, ISBN: 0-85404-528-7
5. J. McMurry: Organic chemistry, Brooks/Cole, a Thomson Learning Company 2004, Sixth Eddition, ISBN 0534389996.

Course language:

slovak, english

Notes:
Teaching is carried out in person or, if necessary, online using the BBB (BigBlueButton) tool. The form of teaching is specified by the teacher at the beginning of the semester, updated continuously.

Course assessment
Total number of assessed students: 86

A	B	C	D	E	FX
79.07	15.12	4.65	1.16	0.0	0.0

Provides: doc. RNDr. Miroslava Martinková, PhD.

Date of last modification: 28.01.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DCH1/15	**Course name:** Didactics of Chemistry I

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 1 / 2 **Per study period:** 14 / 28
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚCHV/SPC1a/03

Conditions for course completion:
1. Participations in seminars (also applies to tohe online form of teaching). Students are required to participate in seminars. The students can excuse themself (incapacity for work, family reasons, etc.) for a maximum of two seminars during the semester without the need for replacement. In the case of a longer-term justified absence (for example due to incapacity for work), the student will be assigned an alternative form of mastering the missed curriculum.
2. Active participation in class. Seminars are conducted in a form in which students are active – students present assignments, which include worksheets. The student is obliged to prepare 2 written assignments and a micro-output, which will be one of the conditions for participation in the exam. Topics of micro-outputs as well as requirements will be available through the e-learning portal LMS Moodle (direct link to the website: https://lms.upjs.sk/) in the course Didactics of Chemistry I (ÚCHV/DCH1/15).
3. The content of the seminars also includes assignments of seminar papers, which the student submits to the course Didactics of Chemistry I (ÚCHV/DCH1/15).
4. The student must pass a continuous assessment in the form of a written exam twice a semester.
5. Passing the exam: distance form of the exam – written test: Due to the current pandemic situation in Slovakia and in accordance with the conditions of the Faculty of Science UPJŠ in Košice, a written form of the exam is implemented through the Google Form application. Students fill in the answers to the written test. Test questions are always randomly generated. Distance form of the exam – oral form through a webinar.
The final assessment in the course consists of the sum of points obtained for:
1. Seminar work (0-20 points)
2. Continuous assessment (0-30 points)
3. Final written test (0-20 points)
4. Oral exam (0-30 points)
Conditions for successful completion of the course:
In order to obtain an A rating, it is necessary to obtain at least 85 points in total, to obtain an B rating at least 75 points, to obtain a C rating at least 65 points, to obtain a D rating at least 55 points and to obtain an E rating at least 45 points.

Learning outcomes:

The student will acquire knowledge and necessary skills for the work of teachers in the field of didactics of general and inorganic chemistry. Can implement inquiry-based learning and digital tools in the teaching of topics from these fields of chemistry at primary school and grammar school with a focus on the use of videos, models, animations, simulations, interactive games and exercises (https://viki.iedu.sk/landing, https://phet.colorado.edu/sk/, https://www.olabs.edu.in/, https://studiumchemie.cz/). Expand your knowledge and skills on how to carry out demonstration experiments and projected experiments using a digital visualizer.

Brief outline of the course:

1. Introduction to didactics of chemistry. History of chemistry didactics and its current state. Teacher preparation for teaching (basic curricular documents: State educational program, school educational program, curricula, thematic educational plan, teacher preparation for a lesson).
2. Teaching aids in chemistry. Information and communication technologies in chemistry teaching.
3. School chemical experiment in chemistry teaching, demonstration and projected experiments.
4. Nomenclature of inorganic chemistry. Use of didactic games.
5. Didactics of the topic Matter, substance, mixture. Inquiry methods in teaching the topic Mixtures and separation of components of mixtures. Inquiry-based method in teaching chemistry.
6. Didactics of the topic Atom, its composition and structure.
7. Didactics of the topic Chemical bonding.
8. Didactics of the topic Periodic table of elements. Interactive periodic table of elements at the Institute of Chemistry Faculty of Science, P. J. Šafárik University in Košice.
9. Didactics of the topic Chemical process. Thermochemistry and Chemical Kinetics.
10. Didactics of the topic Chemical process. Types of chemical reactions. Practical use of redox events. Electrolysis. Galvanic cells. Inquiry activities, computer-based experiments and projected experiments using a digital visualizer on the topic of Chemical process.
11. Presentation of micro-outputs on assigned topics.

Recommended literature:

1. GANAJOVÁ, M.: Vybrané kapitoly zo všeobecnej didaktiky chémie. UPJŠ v Košiciach, Prírodovedecká fakulta, 2009, 141 s. ISBN 978-80-7097-756-9.
2. KIREŠ, M., JEŠKOVÁ, Z., GANAJOVÁ, M., KIMÁKOVÁ, K.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť A. Bratislava: ŠPÚ, 2016. ISBN 978-80-8118-155-9. https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/01cast_a_web.pdf
3. GANAJOVÁ, M., KRISTOFOVÁ, M.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť B. Ukážky vytvorených metodických a pracovných materiálov z predmetu Chémia. Bratislava: ŠPÚ, 2016. https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/04cast_b_chemia_web.pdf
4. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre základné školy. Doplnené vydanie. Bratislava: CVTI SR, 2021. ISBN 978-80-8240-007-9. https://vzdelavanie.itakademia.sk/vystupy/zim-che-zs.pdf
5. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre stredné školy. Doplnené vydanie. Bratislava: CVTI Bratislava: CVTI SR, 2021. ISBN 978-80-8240-008-6. https://vzdelavanie.itakademia.sk/vystupy/zim-che-ss.pdf
6. GANAJOVÁ, M.: Metodika tvorby učebných úloh a didaktických testov pre chémiu. Košice: UPJŠ, 2015. ISBN 978-80-8152-237-6. https://unibook.upjs.sk/sk/prirodovedecka-fakulta/445-metodika-tvorby-ucebnych-uloh-a-didaktickych-testov-pre-chemiu
7. GANAJOVÁ a kol.: Rozvíjanie kompetencií žiakov prostredníctvom učebných úloh z chémie. Bratislava: ŠPÚ, 2018. ISBN 978-80-8118-215-0. https://www.statpedu.sk/files/sk/publikacna-cinnost/publikacie/spu-chemia-2018-web.pdf

8. GANAJOVÁ, M., BRESTENSKÁ, B., GUNIŠ, J., JEŠKOVÁ, Z., KIREŠ, M., LEŠKOVÁ, A., LUKÁČ, S., OROSOVÁ, R., SOTÁKOVÁ, I., SZARKA, K., ŠNAJDER, Ľ.: Formatívne hodnotenie vo výučbe prírodných vied, matematiky a informatiky. 1. vyd. UPJŠ v Košiciach, 2021, 450 s. ISBN 978-80-8152-973-3.
9. Inovovaný štátny vzdelávací program pre 2. stupeň ZŠ. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_nsv_2014.pdf
10. Inovovaný štátny vzdelávací program pre gymnázia so štvorročným a päťročným vzdelávacím programom. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_g_4_5_r.pdf
11. Učebnice chémie pre základné školy a gymnáziá.
12. E – learning kurz: Didaktika chémie I (ÚCHV/DCH1/15), https://lms.upjs.sk/

Course language:

Notes:

Course assessment
Total number of assessed students: 131

A	B	C	D	E	FX
67.18	19.08	8.4	3.05	2.29	0.0

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.

Date of last modification: 21.01.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DCH2/15	**Course name:** Didactics of Chemistry II

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 1 / 2 **Per study period:** 14 / 28
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities: ÚCHV/DCH1/15

Conditions for course completion:
1. Participations in seminars (also applies to tohe online form of teaching). Students are required to participate in seminars. The students can excuse themself (incapacity for work, family reasons, etc.) for a maximum of two seminars during the semester without the need for replacement. In the case of a longer-term justified absence (for example due to incapacity for work), the student will be assigned an alternative form of mastering the missed curriculum.
2. Active participation in class. Seminars are conducted in a form in which students are active – students present assignments, which include worksheets. The student is obliged to prepare 2 written assignments, which will be one of the conditions for participation in the exam. Topics of written assignments as well as requirements will be available through the e-learning portal LMS Moodle (direct link to the website: https://lms.upjs.sk/) in the course Didactics of Chemistry II (ÚCHV/ DCH2/15).
3. The content of the seminars also includes assignments of seminar papers, which the student submits to the course Didactics of Chemistry II (ÚCHV/DCH2/15).
4. The student must pass a continuous assessment in the form of a written exam twice a semester.
5. Passing the exam: distance form of the exam assignments written test: Due to the current pandemic situation in Slovakia and in accordance with the conditions of the Faculty of Science UPJŠ in Košice, a written form of the exam is implemented through the Google Form application. Students fill in the answers to the written test. Test questions are always randomly generated. distance form of the exam assignments assignments – oral form through a webinar.
The final assessment in the course consists of the sum of points obtained for:
1. Written assignments (0-20 points)
2. Seminar work (0-10 points)
3. Written tests (0-20 points)
4. Final written test (20 points)
5. Oral exam (30 points)
Conditions for successful completion of the course: In order to obtain an A rating, it is necessary to obtain at least 85 points in total, to obtain an B rating at least 75 points, to obtain a C rating at least 65 points, to obtain a D rating at least 55 points and to obtain an E rating at least 45 points.

Learning outcomes:

Student will acquire knowledge and necessary skills for the work of teachers in the field of didactics of inorganic and organic chemistry as well as in selected topics of didactics of biochemistry. Can implement inquiry-based learning and digital tools in the teaching of topics from these fields of chemistry at primary school and grammar school with a focus on the use of videos, models, animations, simulations, interactive games and exercises (https://viki.iedu.sk/landing, http://kekule.science.upjs.sk/chemia/index.htm, https://studiumchemie.cz/, http://www.studiumbiochemie.cz/aplikace2.html#10, http://didaktikabiochemie.natur.cuni.cz/db2020/db.html). He is able to included selected topics with an interdisciplinary focus (water quality, greenhouse effect, ozone hole, renewable energy sources) into teaching.

Brief outline of the course:

1. Didactics of calculation tasks in chemistry. Chemical calculations with a focus on the chemistry of everyday life.
2. Didactics of the topic Water. Water hardness, types of water, water conductivity, mineral water. Project-based learning of water, acid rain.
3. Didactics of the topic Air, Global environmental problems: Ozone and the ozone hole, Greenhouse effect.
4. Didactics of inorganic chemistry – selected chemical elements and their inorganic compounds. Alkali metals, alkaline earth metals, selected transition elements. Use of SATL method in teaching chemistry, complex tasks focused on the development of transformation skills.
5. Didactics of organic chemistry. Isomerism in the teaching of organic chemistry - Constitutional isomerism and stereoisomerism.
6. Didactics of the topic Hydrocarbons and hydrocarbon derivatives. SATL method. Energy sources - fossil fuels and renewable energy sources.
7. Plastics, chemistry of macromolecular substances. Use of inquiry-based method in teaching topics: Recognition of plastics, Properties of plastics.
8. Didactics of the topic Natural substances. Use of inquiry-based learning and project-based learning in topics: Proteins, Carbohydrates, Lipids.
9. Didactics of the topic Washing and cleaning agents.
10. Didactics of the topic Additives in food.

Recommended literature:

1. GANAJOVÁ, M. KALAFUTOVÁ, J. a kol.: Projektové vyučovanie v chémii. Didaktická príručka pre učiteľov základných škôl. Bratislava: Štátny pedagogický ústav, 2010. 144 s. ISBN 978-80-8118-058-3.
2. KIREŠ, M., JEŠKOVÁ, Z., GANAJOVÁ, M., KIMÁKOVÁ, K.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť A. Bratislava: ŠPÚ, 2016. ISBN 978-80-8118-155-9. https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/01cast_a_web.pdf
3. GANAJOVÁ, M., KRISTOFOVÁ, M.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť B. Ukážky vytvorených metodických a pracovných materiálov z predmetu Chémia. Bratislava: ŠPÚ, 2016. https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/04cast_b_chemia_web.pdf
4. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre základné školy. Doplnené vydanie. Bratislava: CVTI SR, 2021. ISBN 978-80-8240-007-9. https://vzdelavanie.itakademia.sk/vystupy/zim-che-zs.pdf
5. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre stredné školy. Doplnené vydanie. Bratislava: CVTI SR, 2021. ISBN 978-80-8240-008-6. https://vzdelavanie.itakademia.sk/vystupy/zim-che-ss.pdf

6. GANAJOVÁ, M.: Metodika tvorby učebných úloh a didaktických testov pre chémiu. Košice: UPJŠ, 2015. ISBN 978-80-8152-237-6. https://unibook.upjs.sk/img/cms/2015/pf/didaktika-textyganajova.pdf
7. GANAJOVÁ a kol.: Rozvíjanie kompetencií žiakov prostredníctvom učebných úloh z chémie. Bratislava: ŠPÚ, 2018. ISBN 978-80-8118-215-0. https://www.statpedu.sk/files/sk/publikacna-cinnost/publikacie/spu-chemia-2018-web.pdf
8. GANAJOVÁ, M., BRESTENSKÁ, B., GUNIŠ, J., JEŠKOVÁ, Z., KIREŠ, M., LEŠKOVÁ, A., LUKÁČ, S., OROSOVÁ, R., SOTÁKOVÁ, I., SZARKA, K., ŠNAJDER, Ľ.: Formatívne hodnotenie vo výučbe prírodných vied, matematiky a informatiky. 1. vyd. UPJŠ v Košiciach, 2021, 450 s. ISBN 978-80-8152-973-3.
9. Inovovaný štátny vzdelávací program pre 2. stupeň ZŠ. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_nsv_2014.pdf
10. Inovovaný štátny vzdelávací program pre gymnázia so štvorročným a päťročným vzdelávacím programom. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_g_4_5_r.pdf
11. Školský informačný systém. Chémia. http://kekule.science.upjs.sk/chemia/index.htm
12. E – learning kurz: Didaktika chémie II (ÚCHV/DCH2/15), https://lms.upjs.sk/

Course language:

Notes:

Course assessment

Total number of assessed students: 137

A	B	C	D	E	FX
78.83	13.14	6.57	1.46	0.0	0.0

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.

Date of last modification: 21.01.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ DTCU/15	**Course name:** Digitálne technológie vo výučbe chémie

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 2 **Per study period:** 28 / 28
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 10

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

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.

Date of last modification: 03.05.2015

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DPP1/14	**Course name:** Diploma Project I
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 1	
Recommended semester/trimester of the course: 1.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 65	

abs	n
100.0	0.0

Provides:
Date of last modification: 17.01.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DPP2/14	**Course name:** Diploma Project II
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 2.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 65	

abs	n
100.0	0.0

Provides:
Date of last modification: 17.01.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DPP3/14	**Course name:** Diploma Project III
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 3.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 76	

abs	n
100.0	0.0

Provides:
Date of last modification: 17.01.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/DPOU/14	**Course name:** Diploma Thesis and its Defence

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 14

Recommended semester/trimester of the course:

Course level: II.

Prerequisities: ÚCHV/DPP3/14

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 77

A	B	C	D	E	FX
83.12	14.29	2.6	0.0	0.0	0.0

Provides:

Date of last modification: 26.01.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DSU1a/10	**Course name:** Diplomový seminár z chémie pre XCH
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 2.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 13

abs	n
100.0	0.0

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.
Date of last modification: 21.01.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ DSU1b/10	**Course name:** Diplomový seminár z chémie pre XCH
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 3.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 6

abs	n
100.0	0.0

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.
Date of last modification: 08.02.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ UECH/03	**Course name:** Introduction to Environmental Chemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 1., 3.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Continuous test. Active participation in exercises - elaboration of semester work. Passing the final examination in the form of a written test.

Learning outcomes:
Introduction to topics in environmental chemistry and basic procedures applied for environmental protection.

Brief outline of the course:
Introduction to Environmental Chemistry
Chemical aspects of pollution and environmental problems. Composition and behavior of the atmosphere. Energy balance of the Earth and climate changes. Principles of photochemistry, photoprocesses in the atmosphere. Petroleum, hydrocarbons and coal (characteristics, sources and environmental pollution). Soaps, polymers and synthetic surfactants. Haloorganics and pesticides. Environmental chemistry of some important elements (C, N, S, P, halogens, biologically important metals ...). Environmental chemistry in aqueous media. Aqueous systems, parameters, cycles and their protection. The Earth´s crust (rocks, minerals, soils). Natural and artificial radioactivity, utilization. Energy and energy sources (fossil fuels, nuclear, geothermal, solar energy, wind and water energy). Solid waste disposal and recycling.

Recommended literature:
1. Gary W. van Loon, Stephen J. Duffy: Environmental Chemistry - A Global Perspective, Oxford University Press, Oxford 2003.
2. R. A. Bailey, H. M. Clark, J. P. Ferris, S. Krause, R. L. Strong: Chemistry of the Environment, Academic Press, San Diego 2002.
3. G. Schwedt: The Essential Guide to Environmental Chemistry, Wiley and Sons, London 2001.
4. R. N. Reeve, J. D. Barnes: General Environmental Chemistry, Wiley, London 1994.
5. G. Burton, J. Holman, G. Pilling, D. Waddington: Chemical Storylines, Heinemann, Oxford, London 1994.

Course language:

Notes:

Based on the current pandemic situation in Slovakia and in accordance with the conditions of the Faculty of Natural Sciences of UPJŠ in Košice, the education and examination can also be carried out in a distance form. The tutorial will be carried out in the form of online lectures and consultings in the BigBlueButton system. The written form of the exam takes place through the Google Forms app. Students prepare responses to the final written test. Test questions are randomly generated each time. The final oral exam is conducted through a webinar in BigBlueButton https://bbb.science.upjs.sk/b) system with online generation of random question numbers.

Course assessment

Total number of assessed students: 223

A	B	C	D	E	FX
49.78	21.52	14.8	8.07	5.83	0.0

Provides: doc. RNDr. Andrea Straková Fedorková, PhD.

Date of last modification: 21.01.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ FUMCH1/03	**Course name:** Introduction to Material Chemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 1., 3.

Course level: I., II.

Prerequisities:

Conditions for course completion:
1. Participation in seminars (also applies to the online form of teaching). Students are required to attend seminars. The relevant teacher who leads the seminar will justify the student's justified non-participation (incapacity for work, family reasons, etc.) in a maximum of two seminars during the semester without the need for substitute performance. In the case of a longer-term justified absence (for example due to incapacity for work), the relevant teacher will assign the student an alternative form of mastering the missed material.
2. Activity at seminars. The preparation of students and their activity in seminars is always assessed by the relevant teacher who leads the seminar, within his / her competence.
3. Elaboration and submission of a seminar paper on an assigned topic within the independent work at home and presentation of the most important conclusions of the seminar paper in the form of a PPT presentation. The seminar papers must be handed over to the relevant teacher who leads the seminars by the 12th week of the semester, and the presentation must take place no later than the 8th week of the semester. The seminar work and performance are evaluated by the relevant teacher. Submission of the seminar paper and its successful defense is a condition of admission to the oral exam.
4. The exam is usually carried out orally, resp. in case of restrictions of contact forms of the pedagogical process, the exam will be performed in a suitable distance - electronic form.
5. To successfully master the subject, it is necessary to prove mastery of the required curriculum at least 51%.

Learning outcomes:
To present the different types of functional materials, their atomic structure and mechanical properties.

Brief outline of the course:
Historical perspectives. Materials and human being. Participation of natural science in material engineering. Material revolutions. Classification of materials. Atomic structure and interatomic bonding. Amorphous and crystalline materials. Mechanics of materials. Imperfections in solids. Crystal lattice defects. Point defects. Line defects. Dislocations. Diffusion. Diffusion mechanisms. Deformations and failures, re-crystallization. Deformations. Plastic deformations. Solid solutions. Intermediary phases. Phases in ceramic systems. Phase transformations. Crystallization of metals.

Phase identification methods. Stress and strain. Structure of metallic and ceramic materials. Alloys. Steel. Light metals. Metallic glasses. Gold. Inorganic non-metallic materials. Ceramic construction materials. Ceramic tools. Bio-ceramics. Ceramics in cosmos. High-temperature superconductors. Glass. Building binders. Polymers. Essence of polymers. Thermoplastics. Reactoplastics. Polymer structure. Mechanical properties of polymers. Natural materials. Wood. Bones. Teeth. Conchs and shells. Tectrices.

Recommended literature:

W. D. Callister, Jr.: Fundamentals of Materials Science and Engineering, John Wiley & Sons, 2001.
Brian S. Mitchell: An Introduction to Materials Engineering and Science: For Chemical and Materials Engineers, John Wiley & Sons,
2004.

Course language:
Slovak language.

Notes:
Teaching is carried out in person or, if necessary, remotely using the bbb or MS Teams tool. The form of teaching is specified by the teacher at the beginning of the semester, updated continuously.

Course assessment
Total number of assessed students: 78

A	B	C	D	E	FX
89.74	8.97	0.0	0.0	0.0	1.28

Provides: prof. RNDr. Renáta Oriňaková, DrSc.

Date of last modification: 25.11.2021

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ MPPb/15	**Course name:** Scheduled practice teaching

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 36s
Course method: present

Number of ECTS credits: 1

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: KPE/MPPa/15 and KPE/PDU/15 and (KPPaPZ/PaSPP/09 or KPPaPZ/PPgU/15)

Conditions for course completion:
1. Compulsory attendance during the organisational and informational seminar.
2. Compulsory attendance: sitting in on classes, analytical classes at training schools.
3. Sitting in on classes and analytical classes taught by supervising teachers – 11x.
4. Complete 1 independent teaching session and analytical class under supervision.
5. Submitted Scheduled practice teaching (SPT) documentation.
(Sitting-in records, Written class preparation, List of sitting-in sessions and trainee's performance during SPT, SPT report, Assessment of the trainee's pedagogical performance during SPT).

Learning outcomes:
The student can purposefully perceive and interpret phenomena observed during chemistry classes in terms of subject didactics and psychodidactics. Confront their own preconcepts pertaining to subject didactics and psychodidactics with the actual teachers' concepts in practice. Gain motivation for further study of the respective disciplines in terms of their own specialisation and for purposeful development of professional competences. Apply didactic skills to teach chemistry by designing a lesson project and teaching it in practice.

Brief outline of the course:
Students observe the process of teaching the subject of chemistry in primary school and secondary school and analyze it with supervising teacher. The internship takes place continuously during the semester. It is included in the timetable once a week at time 1-3. lessons at primary and secondary schools. The first two hours students observe/teach, the third lesson is an analysis.
Observation, perception, and analysis of subject-specific and psychodidactic phenomena in the way chemistry is taught at the training schools. Written evaluation and theoretical generalisation of the phenomena observed during the classes. Didactic Scheduled practice teaching analysis. Analysis of the perceived phenomena, theoretical generalisation, and comparison of the findings against theory. Written class preparation for teaching a lesson in chemistry. Trainee's teaching performance.

Recommended literature:
Current chemistry textbooks for primary and secondary schools in the Slovak Republic.

Course language:

Notes:

Course assessment Total number of assessed students: 313	
abs	n
100.0	0.0
Provides: RNDr. Ivana Sotáková, Ph.D., doc. RNDr. Mária Ganajová, CSc.	
Date of last modification: 26.10.2021	
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ VKAU/04	**Course name:** Selected Topics in Inorganic Chemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:
Greenwood, N.N., Earnshaw, A.: Chemistry of the elements I and II, Pergamon Press N.Y., 1993.
C. N. R. Rao, A. Muller, A. K. Cheetham: The Chemistry of Nanomaterials (Vol. 1,2), Wiley-VCH,2006.
Atkins O., Overton T., Rourke J., Weller M., Armstrong F.: Inorganic Chemistry, University Press, Oxford, 2006.

Course language:

Notes:

Course assessment
Total number of assessed students: 96

A	B	C	D	E	FX
46.88	29.17	19.79	2.08	2.08	0.0

Provides: prof. RNDr. Vladimír Zeleňák, DrSc.

Date of last modification: 08.09.2021

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ VKOCH/03	**Course name:** Selected topics in organic chemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 115

A	B	C	D	E	FX
36.52	25.22	19.13	13.04	6.09	0.0

Provides: doc. RNDr. Ján Imrich, CSc.

Date of last modification: 10.09.2021

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ SPC1a/03	**Course name:** Special Practising the School Experiments I

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 4 **Per study period:** 56
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
1. Participations in exercises (also applies to tohe online form of teaching). Students are required to participate in laboratory exercises. The students can excuse themself (incapacity for work, family reasons, etc.) for a maximum of two exercises during the semester without the need for replacement. In the case of a longer-term justified absence (for example due to incapacity for work), the student will be assigned an alternative form of mastering the missed curriculum.
2. Active participation in class. Students are active – they master the knowledge of general and inorganic chemistry, they know the working procedures for experiments, which include worksheets, cooperation and communication in pairs/groups and presentation of the results of their work. Learning materials will be available through the e-learning portal LMS Moodle (direct link to the website: https://lms.upjs.sk/) in the course Special Practising the School Experiments I (ÚCHV/ SPC1a/03c).
3. Outputs – presentation of experiments for primary and secondary school. There will be two outputs focused on demonstration experiments on selected topics of primary and secondary school chemistry.
4. A part of the student's assessment in the subject is also a written test, given in the 8th week of teaching.
The final assessment in the course consists of the sum of points obtained for:
1. Active preparation for exercises (0-30 points).
2. Outputs – presentation of experiments for primary and secondary schools (0-20 points).
3. Written test (0-50 points).
Conditions for successful completion of the course: In order to obtain an A rating, it is necessary to obtain at least 85 points in total, to obtain an B rating at least 75 points, to obtain a C rating at least 65 points, to obtain a D rating at least 55 points and to obtain an E rating at least 45 points.

Learning outcomes:
The aim of the course is to acquire and consolidate basic experimental skills and habits in work techniques in school demonstration experiments with an emphasis on the safety and health of students in student experimental work. Students will also acquire basic knowledge and skills in the field of inquiry-based learning and work with computer-based chemical experiments.

Brief outline of the course:

1. General instructions for work in a school chemical laboratory.
2. Basic chemical concepts.
3. Basic chemical laws and properties of substances. Solubility of substances. Solutions. Determination of physical and chemical constants.
4. Energy changes in chemical reactions. Factors affecting the rate of chemical reactions.
5. Experiments on the topic of oxygen, hydrogen, air.
6. Halogens and their compounds.
7. Chalcogens and their compounds.
8. Carbon, nitrogen and their compounds.
9. Acids and bases.
10. Chemistry of everyday life in school experiments.
11. Environmental chemistry. Interesting school experiments.

Recommended literature:

1. GANAJOVÁ, M., DZURILLOVÁ, M.: Školské pokusy z chémie I. Košice: UPJŠ v Košiciach, Prírodovedecká fakulta, 2005. ISBN 80-7097-617-9.
2. KIREŠ, M., JEŠKOVÁ, Z., GANAJOVÁ, M., KIMÁKOVÁ, K.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť A. Bratislava: ŠPÚ, 2016. ISBN 978-80-8118-155-9. https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/01cast_a_web.pdf
3. GANAJOVÁ, M., KRISTOFOVÁ, M.: Bádateľské aktivity v prírodovednom vzdelávaní. Časť B. Ukážky vytvorených metodických a pracovných materiálov z predmetu Chémia. Bratislava: ŠPÚ, 2016. ISBN 978-80-8118-155-9. https://www.statpedu.sk/files/articles/nove_dokumenty/ucebnice-metodiky-publikacie/badatelske-aktivity/04cast_b_chemia_web.pdf
4. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre základné školy. Doplnené vydanie. Bratislava: CVTI SR, 2021. ISBN 978-80-8240-007-9. https://vzdelavanie.itakademia.sk/vystupy/zim-che-zs.pdf
5. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre stredné školy. Doplnené vydanie. Bratislava: CVTI Bratislava: CVTI SR, 2021. ISBN 978-80-8240-008-6. https://vzdelavanie.itakademia.sk/vystupy/zim-che-ss.pdf
6. Inovovaný štátny vzdelávací program pre 2. stupeň ZŠ. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_nsv_2014.pdf
7. Inovovaný štátny vzdelávací program pre gymnázia so štvorročným a päťročným vzdelávacím programom. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_g_4_5_r.pdf
8. Učebnice chémie pre základné školy a gymnáziá.
9. Školský informačný systém. Chémia. http://kekule.science.upjs.sk/chemia/index.htm
10. Virtuálne prírodovedecké laboratórium. http://www.virtual-lab.sk/videozaznamy.html
11. Studium chemie. Portál PřF UK pro podporu vyuky chemie na SŠ a ZŠ. https://studiumchemie.cz/
12. E-ChemBook – Multimediální učebnice chemie. https://www.youtube.com/user/VideosChemWeb/videos
13. E – learning kurz: Špeciálne praktikum školských pokusov I (ÚCHV/SPC1a/03c) https://lms.upjs.sk/

Course language:

Notes:

Course assessment
Total number of assessed students: 296

A	B	C	D	E	FX
67.91	24.66	6.42	1.01	0.0	0.0

Provides: doc. RNDr. Mária Ganajová, CSc., RNDr. Ivana Sotáková, Ph.D.

Date of last modification: 09.02.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ SPC1b/03	**Course name:** Special practising the school experiments II

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 3 **Per study period:** 42
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
1. Pressence is complusory. In the case of long-term absence can student realize experiments in alternative term.
2. Students activity - knowledges about reaction mechanisms and experimental skills to realize experiments.
3. Make reports of every exercise.
Classification:
1. Short exams on the beginning of every exercise (max 35 points)
2. Reports of every exercise (max 15 points)
3. Two exams (each max 25 points, min 51%)
A: 100 – 91%
B: 90 – 81%
C: 80 – 71%
D: 70 – 61%
E: 60 – 51%

Learning outcomes:
The students will become familiar with the basic laboratory skills and techniques that they can apply in demonstrating experiments in their future career as a teacher. The rules of healthy and safety laboratory work are emphasised. Students will apply their knowledges and sklills in exploration activities in the topic of Natural compounds on the basis of 5E. They can motivate students using chemical experiments (https://studiumchemie.cz/, https://www.youtube.com/user/VideosChemWeb/videos, http://www.e-chembook.eu/).

Brief outline of the course:
1. Qualitative analysis of organic compounds - confirmation reactions for carbon, hydrogen, halogens and nitrogen.
2. Alkanes - preparation of methane.
3. Alkenes - preparation of ethene and its confirmation using its addition reactions; addition reactions of β-carotene.
4. Alkynes - preparation of acetylene and its derivatives, confirmation reactions of acetylene.

5. Aromatic hydrocarbons and their derivatives – preparation of benzene, aromatic electrophilic substitution reactions – nitration of toluene and naphthalene, preparation of benzyl bromide.
6. Halogenoderivatives – preparation of chloroethane and iodoform.
7. Hydroxoderivatives – oxidation reactions of ethanol, ability to distinguish methanol from ethanol, confirmation reaction of glycerol, preparation of sodium ethanolate and sodium phenoxide, bromation of phenol, colour reactions of phenols and naphtols.
8. Ethers – properties of diethyl ether.
9. Carbonyl compounds - preparation of formaldehyde and acetaldehyde, confirmation reactions of aldehydes and ketones.
10. Carboxylic acids and their derivatives – esterification reactions, reaction of carboxylic acids with magnesium, preparation and properties of soap.
11. Natural compounds – carbohydrates, proteins, amino acids, lipids. Exploration activities on the topic of Natural compounds: fermentation, bioglue, murder and food
12. Natural pH indicator - study of its colur changes depending on pH values.
13. Column chromatography -acetylation reaction of ferrocene - its preparation and separation of the obtained products by column chromatography.
14. Isolation of the fragrant components using steam distillation.
15. Everyday life chemistry.

Recommended literature:

1. SMIK, L., MERVA, L., BRUTOVSKÁ, A: Technika a didaktika školských pokusov Košice: Vyd. Rektorát UPJŠ, 1988.
2. SMIK, L. a kol.: Špeciálna didaktika chémie II., Košice: Vyd. Rektorát UPJŠ, 1984.
3. Špeciálne praktikum školských pokusov z organickej chémie – Interné skriptá.
4. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre základné školy. 1. doplnené vydanie. Bratislava: CVTI SR, 2021. https://vzdelavanie.itakademia.sk/vystupy/zim-che-zs.pdf
5. GANAJOVÁ a kol.: Zbierka inovatívnych metodík z chémie pre stredné školy. 1. doplnené vydanie. Bratislava: CVTI SR, 2021. https://vzdelavanie.itakademia.sk/vystupy/zim-che-ss.pdf
6. Inovovaný štátny vzdelávací program pre 2. stupeň ZŠ. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_nsv_2014.pdf
7. Inovovaný štátny vzdelávací program pre gymnázia so štvorročným a päťročným vzdelávacím programom. Človek a príroda. Chémia. https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/chemia_g_4_5_r.pdf
8. Učebnice chémie pre základné školy a gymnáziá.
9. Studium chemie. Portál PřF UK pro podporu vyuky chemie na SŠ a ZŠ. https://studiumchemie.cz/
10. E-ChemBook – Multimediální učebnice chemie. https://www.youtube.com/user/VideosChemWeb/videos

Course language:
slovak language

Notes:

Course assessment
Total number of assessed students: 291

A	B	C	D	E	FX
45.7	28.18	16.15	6.87	3.09	0.0

Provides: RNDr. Jana Špaková Raschmanová, PhD., RNDr. Ján Elečko, PhD., RNDr. Slávka Hamuľaková, PhD.
Date of last modification: 21.01.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚCHV/ SAZ1/15	**Course name:** Stereochemistry of Inorganic Compounds

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course:

Course level: II.

Prerequisities:

Conditions for course completion:
Successful completion of two written tests (2 x 50b) in the middle and at the end of the semester. Final written test (100b) in the examination period. A minimum of 50% for each test is considered successful. The exact dates will be determined after mutual consultation between the teacher and the students. The rating scale is determined as follows: A (100-91%), B (90-81%), C (80-71%), D (70-61%), E (60-51%), Fx (50- 0%).

Learning outcomes:
Gaining knowledge of the structure, isomerism and stereochemistry of inorganic compounds.

Brief outline of the course:
Molecular symmetry, distribution of electron pairs on valence shell, configuration of molecules, polyhedral-regular, semi-regular, irregular, chemical coordination polyhedra, secondary building units, spin and charge correlation, non-equivalence of electron pairs, molecular geometry

Recommended literature:
Kepert, D.L.: Inorganic stereochemistry, Sringer, 1982.
Morris, D.G.: Stereochemistry, Royal Society of Chemistry, 2001
Schiermund, T.: Introduction to stereochemistry, Springer, 2021.

Course language:
SK - slovak

Notes:
The subject is carried out in person or, if necessary, remotely using the online platform Big Blue Button (BBB). The form of teaching is specified by the teacher at the beginning of the semester and updated continuously. A notebook is required for the exercises, as some assignments require data analysis in graphics programs.

Course assessment
Total number of assessed students: 31

A	B	C	D	E	FX
64.52	16.13	12.9	6.45	0.0	0.0

Provides: prof. RNDr. Vladimír Zeleňák, DrSc.
Date of last modification: 27.01.2022
Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ STA1/03	**Course name:** Structure Analysis
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 2 **Per study period:** 28 / 28 **Course method:** present	
Number of ECTS credits: 6	
Recommended semester/trimester of the course:	
Course level: II.	
Prerequisities:	
Conditions for course completion: 2 written tests during semester and written examination. The final evaluation is based on the results from the tests (30 %) and written examination (70 %). The student must obtain at least 51% of each test and exam. The same is valid also for online education.	
Learning outcomes: Students get an overview about the symmetry at the micro- and macrostructure level, about principles of difraction and about diffraction methods used for the crystal structure determination and they will learn how to use the results of the crystal structure analysis in their own work.	
Brief outline of the course: Macrostructure and microstructure symmetry, individual work with space groups. Theoretical basis of the diffraction experiment. Practical aspects of crystal structure solution. Processing the results of structural analysis. Theoretical basis, practical aspects and possibilities of X-ray powder diffraction analysis, its use at work of a chemist.	
Recommended literature: Massa, W.: Crystal structure determination, 2nd edition. Springer 2004. Clegg, W. et al.: Crystal structure analysis. Principles and practice. Oxford University Press 2009. Hahn, T.: International tables for crystallography, Vol. A. Kluwer Academic Publishers 2002. Klug, H.P. & Alexander, L.E.: X-Ray diffraction procedures for polycrystalline and amorphous materials. John Wiley & Sons, Inc. 1970.	
Course language: Slovak and English	
Notes: Teaching is carried out in person or, if necessary, online using the MS Teams tool. The form of teaching is specified by the teacher at the beginning of the semester, updated continuously.	

Course assessment
Total number of assessed students: 144

A	B	C	D	E	FX
27.08	15.97	29.17	20.14	6.94	0.69

Provides: doc. RNDr. Ivan Potočňák, PhD.

Date of last modification: 21.07.2022

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚCHV/ VKCH/10	**Course name:** Vybrané kapitoly z chémie

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Terminal examination by written form.

Learning outcomes:
Organic chemistry:
The general review on the basic chemistry of saccharides, lipids, amino acids and peptides.
Inorganic chemstry:
To get acquaintance of the students with the stereochemistry of inorganic compounds, methods of the study and its influence on the properties of the compounds. Moreover to get acqaintance of the students with actual direction of inorganic chemistry in the area of nanomaterials.

Brief outline of the course:
Organic chemistry:
Nomenclature of monosaccharides, their stereochemistry (the Fischer projection, the Haworth projection, conformation of sugars). Monosaccharide derivatives. Ascending reactions. Oligosaccharides and polysaccharides.
Lipids, their structure and classification. Groups of lipids. Triacylglycerols, glycerophospholipids sfingophospholipids, glycosphingolipids.
Amino acids, their nomenclature, classification and stereochemistry. Synthesis of amino acids. Nonribosomal construction of peptides.
Inorganic chemistry:
Symmetry, elements of symmetry, point groups, symmetrical properties of orbitals and bonds. Principles of stereochemistry, VSEPR, configuration of molecules, polyhedra, regular and semiregular polyhedra, the use of concept of symmetry in IR and UV-VIS spectroscopy. Nanochemistry - definition, bonds in nanoparticles and nanopowders, interactions between nanoparticles. Unique properties of nanomaterials, new methods of the synthesis of nanomaterials.

Recommended literature:
J. McMurry: Organic chemistry, Books/Cole, a Thomson Learning Company 2004, Sixth Eddition, ISBN 0534389996.
J. Chomič: Stereochemistry of inorganic compounds, UPJŠ Košice, 1988.
K. J. Klabunde, R. M. Richards: Nanoscale Materials in Chemistry, Wiley-CH, 2009.

Course language:

Notes:

Course assessment
Total number of assessed students: 232

A	B	C	D	E	FX
27.59	28.45	30.6	11.21	1.72	0.43

Provides: prof. RNDr. Mária Kožurková, CSc., prof. RNDr. Vladimír Zeleňák, DrSc., doc. RNDr. Miroslava Martinková, PhD.

Date of last modification: 15.09.2021

Approved: prof. PhDr. Oľga Orosová, CSc., doc. RNDr. Mária Ganajová, CSc.