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## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> CJP/ PFAJAKA/07	<b>Course name:</b> Academic English
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Active classroom participation, assignments handed in on time, 2 absences tolerated 1 test (13th week), no retake. Presentation on chosen topic Final evaluation- average assessment of test (50%), and presentation (50%). Grading scale: A 93-100%, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64% and less	
<b>Learning outcomes:</b> The development of students' language skills - reading, writing, listening, speaking, improvement of their linguistic competence - students acquire knowledge of selected phonological, lexical and syntactic aspects, development of pragmatic competence - students can effectively use the language for a given purpose, with focus on Academic English, level B2.	
<b>Brief outline of the course:</b> Formal and informal English Academic English and its specific features Key academic verbs and nouns Linking words in academic writing, writing a paragraph, word-order, topic sentences Word-formation - affixation abstract Selected aspects of English pronunciation, academic vocabulary Selected functional grammar structures - defining, classifying, expressing opinion, cause-effect, paraphrasing	
<b>Recommended literature:</b> Seal B.: Academic Encounters, CUP, 2002 T. Armer :Cambridge English for Scientists, CUP 2011 M. McCarthy M., O'Dell F. - Academic Vocabulary in Use, CUP 2008 Zemach, D.E, Rumisek, L.A: Academic Writing, Macmillan 2005 Olsen, A. : Active Vocabulary, Pearson, 2013 www.bbclearningenglish.com Cambridge Academic Content Dictionary, CUP, 2009	

<b>Course language:</b> English language, level B2 according to CEFR.					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 456					
A	B	C	D	E	FX
36.18	21.93	15.13	9.65	5.48	11.62
<b>Provides:</b> Mgr. Viktória Mária Slovenská					
<b>Date of last modification:</b> 17.09.2025					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ ALGa/10		<b>Course name:</b> Algebra I			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 / 3 <b>Per study period:</b> 42 / 42 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 7					
<b>Recommended semester/trimester of the course:</b> 1.					
<b>Course level:</b> I.					
<b>Prerequisites:</b>					
<b>Conditions for course completion:</b> According to the results from the semester and in view of the results of the written and oral final exam..					
<b>Learning outcomes:</b> To acquire the methods of mathematical thinking and cognition. Gain basic knowledge of number theory related to divisibility, master the basic concepts of linear algebra and be able to apply them to specific problems and mathematical problems.					
<b>Brief outline of the course:</b> Divisibility in $\mathbb{Z}$ . Fields. Systems of linear equations, Gauss elimination. Maps, permutations. Computing with matrices. Determinants, Cramer rule.					
<b>Recommended literature:</b> T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985. T.S Blyth, E.F. Robertson: Basic linear algebra, Springer Verlag, 2001. K. Jänich: Linear algebra, Springer Verlag, 1991.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 1540					
A	B	C	D	E	FX
11.49	11.49	17.92	17.53	28.12	13.44
<b>Provides:</b> RNDr. Lucia Kőszegiová, PhD., Mgr. Martin Vodička, Dr. rer. nat., RNDr. Radka Schwartzová, Mgr. Simona Volesková, Mgr. Branislav Pastula					
<b>Date of last modification:</b> 16.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ ALG1b/24	<b>Course name:</b> Algebra II
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 4 / 2 <b>Per study period:</b> 56 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 7	
<b>Recommended semester/trimester of the course:</b> 2.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/ALGa/10	
<b>Conditions for course completion:</b> According to exams and homeworks during the term, written exam and oral exam. The exam consist of showing the ability to use the knowledge to solve exercises, ability to define the terms from lessons, state and prove propositions and theorems. Scale: 0-49 Fx, 50-59 E, 60-69 D, 70-79 C, 80-89 B, 90-100 A.	
<b>Learning outcomes:</b> Obtaining a deeper knowledge on vector spaces and systems of linear equations, gaining basic knowledge of linear mappings, polynomials and polynomial equations. Developing abstract thinking of students.	
<b>Brief outline of the course:</b> <ul style="list-style-type: none"> <li>- Vector spaces, subspaces.</li> <li>- A basis, a dimension and a characterization of n-dimensional vector spaces.</li> <li>- The rank of a matrix, the Frobenius theorem.</li> <li>- Homogeneous systems of linear equations, a fundamental solution set.</li> <li>- Linear mappings and transformations. Compositions of linear mappings. Matrices, kernel and image of linear mapping. Regular linear transformations.</li> <li>- Ring, integral domain. Integral domain of polynomials over a field. Divisibility of polynomials, irreducible polynomials. Roots of polynomials.</li> </ul>	
<b>Recommended literature:</b> T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985 A. F. Beardon: Algebra and Geometry, Cambridge University Press, 2005 G. Birkhoff, S. Mac Lane: A Survey of Modern Algebra, New York 1965	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 218					
A	B	C	D	E	FX
15.14	12.84	15.6	18.81	36.24	1.38
<b>Provides:</b> RNDr. Lucia Kőszegyová, PhD., doc. RNDr. Roman Soták, PhD.					
<b>Date of last modification:</b> 29.02.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ ALG1c/24	<b>Course name:</b> Algebra III
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 4 / 2 <b>Per study period:</b> 56 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 7	
<b>Recommended semester/trimester of the course:</b> 3.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/ALG1b/24 or ÚMV/ALG2b/22	
<b>Conditions for course completion:</b> Awarded according to continual evaluation, written and oral examination.	
<b>Learning outcomes:</b> The students learn basic concepts, theorems and methods of linear algebra, at the level necessary for applications in geometry and other parts of mathematics. They obtain knowledge about the fundamentals of group theory and ring theory, and about properties of the polynomial integral domains.	
<b>Brief outline of the course:</b> <ul style="list-style-type: none"> <li>- Affine spaces, subspaces and their positions.</li> <li>- Convex sets, convex polyhedrons.</li> <li>- Algebraic planes.</li> <li>- Eigenvalues and eigenvectors.</li> <li>- Similarity of matrices, rational and Jordan canonical form.</li> <li>. Bilinear and quadratic forms, Sylvester law.</li> <li>- Groups, subgroups, cyclic groups.</li> <li>- Normal subgroups, factorization, isomorphism theorems.</li> </ul>	
<b>Recommended literature:</b> G. Birkhoff, S. MacLane: Prehľad modernej algebry, Alfa Bratislava, 1979 M. Hejný a kol.: Geometria 1, SNP, Bratislava 1985 M. Sekanina a kol.: Geometrie 1, SNP Praha 1986 T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985 D.A.R. Wallace: Groups, rings and fields, Springer, 1998	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 145					
A	B	C	D	E	FX
12.41	19.31	17.93	25.52	24.14	0.69
<b>Provides:</b> doc. RNDr. Miroslav Ploščica, CSc.					
<b>Date of last modification:</b> 04.03.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ ALG1d/10		<b>Course name:</b> Algebra IV			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 5					
<b>Recommended semester/trimester of the course:</b> 6.					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/ALG1c/24					
<b>Conditions for course completion:</b> Awarded according to continual evaluation, written and oral examination.					
<b>Learning outcomes:</b> The students deepen their knowledge about groups, rings and fields. They learn the fundamentals of algebraic numbers, extensions of fields and Galois theory. They obtain basic orientation in the methods of a modern algebra.					
<b>Brief outline of the course:</b> - Ideals in rings, factorization. -Field extensions, algebraic elements. Finite and algebraic extensions. Constructions with straightedge and compass. Algebraic numbers. Finite fields. - Solvable groups. Galois groups of polynomials.					
<b>Recommended literature:</b> G. Birkhoff, S. MacLane: Prehľad modernej algebry, Alfa Bratislava, 1979 (in Slovak) T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985 (in Slovak) J. J. Rotman: Advanced Modern Algebra, Amer. Math. Soc., Providence, 2010 S. MacLane, G.Birkhoff: Algebra, The Macmillan Company, New York, 1964					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 77					
A	B	C	D	E	FX
18.18	16.88	27.27	22.08	15.58	0.0
<b>Provides:</b> doc. RNDr. Miroslav Ploščica, CSc.					
<b>Date of last modification:</b> 24.03.2023					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ ASU1/15	<b>Course name:</b> Algorithms and data structures
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 6.	
<b>Course level:</b> I., N	
<b>Prerequisites:</b> ÚINF/PAZ1a/15 and ÚINF/PAZ1b/15	
<b>Conditions for course completion:</b> Practice activities, homeworks and midterm exam. Final examination consisting of practice and theoretical test.	
<b>Learning outcomes:</b> Understand and learn algorithmic paradigms and data structures. Analyse time complexity of these algorithms.	
<b>Brief outline of the course:</b> Algorithms' time and space asymptotic complexity. Main Theorem. Amortized complexity. Brute Force. Backtrack. Divide and Conquer. Dynamic programming. Comparison and non-comparison sort algorithms. Sweep line algorithms. Graph Theory Algorithms. Data structures – queue, stack, priority queue, heap, prefix sum, binary search trees, interval trees, union & find, trie.	
<b>Recommended literature:</b> 1, Laaksonen A.: Guide to Competitive Programming: Learning and Improving Algorithms Through Contests (Undergraduate Topics in Computer Science), Springer, 2017, ISBN 978-3319725468 2, Forišek M., Steinová M.: Explaining Algorithms Using Metaphors. Springer Briefs in Computer Science, Springer (2013), ISBN 978-1-4471-5018-3 3, R. Sedgewick, K. Wayne: Algorithms (4th Edition), Addison-Wesley Professional, 2011, ISBN 978-0321573513, <a href="http://algs4.cs.princeton.edu/home/">http://algs4.cs.princeton.edu/home/</a> 4, Open Data Structures: <a href="http://opendatastructures.org/">http://opendatastructures.org/</a>	
<b>Course language:</b> Slovak or english	
<b>Notes:</b> Content prerequisites: - programming skills in some programming language (Python/Java/C++/...) - mathematics: -- computing with polynomials, logarithmic and exponential functions -- computing limits of sequences, L'Hospital rule	

<b>Course assessment</b>					
Total number of assessed students: 240					
A	B	C	D	E	FX
12.5	6.25	17.5	30.0	31.25	2.5
<b>Provides:</b> RNDr. Rastislav Krivoš-Belluš, PhD.					
<b>Date of last modification:</b> 08.01.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ AFJ1a/15	<b>Course name:</b> Automata and formal languages
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 4., 6.	
<b>Course level:</b> I., N	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Oral examination.	
<b>Learning outcomes:</b> To provide theoretical background for studying computer science in general, by giving the necessary knowledge in theory of automata.	
<b>Brief outline of the course:</b> 1: Chomsky hierarchy of grammars: alphabet, symbol (letter, character), transitive closure, word (string), empty word (empty string), length of a string, concatenation, language, grammar, nonterminal symbol, terminal symbol, initial nonterminal (initial symbol), grammar rule, derivation step, language generated by a grammar, Chomsky hierarchy of grammars - phrase-structure, context sensitive, context free, regular 2: Deterministic finite state automata: finite state automaton, state, input symbol, output symbol, initial state, transition function, output function, examples of automata and their graphic representation, generalized transition and output functions and their basic properties 3: Reduction of automata I: equivalent automata, minimal (optimal) automaton, reachable state, properties of reachable states, elimination of unreachable states 4: Reduction of automata II: equivalent states, k-equivalent states, properties of equivalence and k-equivalence, relation between k-equivalence and (k+1)-equivalence, partitioning the state set into equivalence classes, elimination of equivalent states 5: Reduction of automata III: proof of correctness, unambiguity, and optimality of reduced automaton, testing equivalence of two automata 6: Deterministic finite state acceptors: basic definitions, language recognized by a finite state acceptor, common properties of acceptors and automata with an output, minimizing a finite state acceptor 7: Operations with regular languages: complement, intersection, union, difference, symmetric difference, testing of emptiness, inclusion, equality, and disjointness for regular languages 8: Nondeterministic finite state acceptors: definition, transition function, language recognized by a nondeterministic acceptor, elimination of nondeterminism 9: epsilon-acceptors: definition, properties, elimination of epsilon-transitions	

10: Regular grammars: regular grammar, extended regular grammar, transformation of acceptor to a regular grammar, transformation of extended regular grammar to an epsilon-acceptor  
 11: Regular expressions I: basic properties, transformation of regular expression to an epsilon-acceptor  
 12: Regular expressions II: regular equations, valid algebraic manipulations with regular expressions, solving an equation with a single unknown variable, solving a system of regular equations, transformation of acceptor to a regular expression  
 13: Another constructions: review of transformations among various representations, an example of a direct transformation of a grammar to a regular expression, closure of the class of regular languages under another language operations – concatenation and Kleene star, mirror image  
 14: Another operations: homomorphism and inverse homomorphism, a context-free language that is not regular

**Recommended literature:**  
 J.E. Hopcroft, R.Motwani, J.D. Ullman: Introduction to automata theory, languages, and computation, Addison-Wesley, 2001.  
 J. Shallit: A second course in formal languages and automata theory, Cambridge University press, 2009.  
 M. Sipser: Introduction to the theory of computation, Thomson Course Technology, 2006.

**Course language:**  
 Slovak or English

**Notes:**

**Course assessment**  
 Total number of assessed students: 966

A	B	C	D	E	FX
26.92	18.63	23.91	16.05	9.83	4.66

**Provides:** RNDr. Juraj Šebej, PhD., univerzitný docent

**Date of last modification:** 23.11.2021

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ BKPa/22	<b>Course name:</b> Bachelor project I
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 1 <b>Per study period:</b> 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 1	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> To prepare and present a contribution related to thesis and its topic.	
<b>Learning outcomes:</b> To get students familiar with basic knowledge on the form and content of thesis and thesis presentation as well as with the support for its realisation.	
<b>Brief outline of the course:</b> Necessary elements and formal aspects of a thesis. WYSIWYG editors, LaTeX, drawing programs. Presentation software, Microsoft PowerPoint and its clones, Beamer. Suggestions for presentation and contribution making.	
<b>Recommended literature:</b> electronic information sources	
<b>Course language:</b> Slovak and English	
<b>Notes:</b>	
<b>Course assessment</b> Total number of assessed students: 150	
abs	n
100.0	0.0
<b>Provides:</b> prof. RNDr. Ondrej Hutník, PhD.	
<b>Date of last modification:</b> 24.08.2022	
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.	

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ BKPb/22	<b>Course name:</b> Bachelor project II
<b>Course type, scope and the method:</b> <b>Course type:</b> <b>Recommended course-load (hours):</b> <b>Per week: Per study period:</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 6.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b>	
<b>Learning outcomes:</b>	
<b>Brief outline of the course:</b>	
<b>Recommended literature:</b>	
<b>Course language:</b>	
<b>Notes:</b>	
<b>Course assessment</b> Total number of assessed students: 129	
abs	n
100.0	0.0
<b>Provides:</b>	
<b>Date of last modification:</b> 24.08.2022	
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.	

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ BPO/14	<b>Course name:</b> Bachelor thesis and its defence
<b>Course type, scope and the method:</b> <b>Course type:</b> <b>Recommended course-load (hours):</b> <b>Per week: Per study period:</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> The bachelor thesis is the result of the student's own work. It must not show elements of academic fraud and must meet the criteria of good research practice defined in the Rector's Decision no. 21/2021, which lays down the rules for assessing plagiarism at Pavol Jozef Šafárik University in Košice and its components. Fulfillment of the criteria is verified mainly in the supervision process and in the process of thesis defense. Failure to do so is reason for disciplinary action.	
<b>Learning outcomes:</b> Evaluation of student's competences with respect to the profile of the graduate. The bachelor's thesis demonstrates mastery of the basics of theory and professional terminology of the field of study, acquisition of knowledge, skills and competencies in accordance with the declared profile of the graduate of the study program, as well as the ability to apply them creatively in solving selected field problems. The bachelor thesis may have elements of compilation. The student demonstrates the ability of independent professional work in terms of content, formal and ethical. Further details on the bachelor thesis are determined by Directive no. 1/2011 on the basic requirements of final theses and the Study Regulations of UPJŠ in Košice.	
<b>Brief outline of the course:</b> 1. Elaboration of the bachelor thesis in accordance with the instructions of the supervisor. 2. Presentation of the results of the bachelor's thesis before the examination commission. 3. Answering questions related to the topic of the bachelor thesis within the discussion.	
<b>Recommended literature:</b> The recommended literature is determined individually in accordance with the topic of the bachelor's thesis.	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 220					
A	B	C	D	E	FX
67.73	17.73	9.09	3.18	1.82	0.45
<b>Provides:</b>					
<b>Date of last modification:</b> 19.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ ZBR/14	<b>Course name:</b> Bridge fundamentals
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 3.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Active participation on exercises.	
<b>Learning outcomes:</b> A student gets acquainted with fundamentals of the contract bridge, develops his/her logical thinking and consolidates his/her habits of positive social behaviour.	
<b>Brief outline of the course:</b> Bridge rules. Principles of the bidding system Standard American. Basic techniques of declarer's play. Basic techniques of the defence. Lead conventions, signals. Common bidding conventions. Selected advanced techniques of the card play. Partnership cooperation in the contract bridge. Bridge ethics.	
<b>Recommended literature:</b> T. Menyhért: Kurz bridžu 2013, <a href="http://new.bridgekosice.sk/kurz-bridzu-2013/">http://new.bridgekosice.sk/kurz-bridzu-2013/</a> R. Pavlicek: Learn To Play Bridge!, <a href="http://www.rpbridge.net/1a00.htm">http://www.rpbridge.net/1a00.htm</a> ACBL SAYC System Booklet, <a href="http://ebookbrowse.net/acbl-sayc-pdf-d201415187">http://ebookbrowse.net/acbl-sayc-pdf-d201415187</a>	
<b>Course language:</b> Slovak or English	
<b>Notes:</b> Minimum number of participants is 4.	
<b>Course assessment</b> Total number of assessed students: 45	
abs	n
97.78	2.22

<b>Provides:</b> doc. RNDr. Miroslav Ploščica, CSc., Mgr. Martin Vodička, Dr. rer. nat.
<b>Date of last modification:</b> 08.02.2022
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> CJP/ PFAJKKA/07	<b>Course name:</b> Communicative Competence in English
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Active participation in class and completed homework assignments. Students are allowed to miss two classes at the most. 2 credit tests (presumably in weeks 6/7 and 12/13) and an oral presentation in English. Final evaluation consists of the scores obtained for the 2 tests (50%). Final grade will be calculated as follows: A 93-100 %, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64 % and less.	
<b>Learning outcomes:</b> Students will acquire knowledge and improve their communicative language competencies for using the language in practical communication situations. They will gain pragmatic and subject-specific competencies that enhance communication, improve their ability to comprehend and formulate statements, and effectively express their ideas in an academic context at the B2–C1 language level according to the CEFR.	
<b>Brief outline of the course:</b> Expressing opinions, feelings, and impressions. Forms and dialects in the English language. Expressing similarities and differences, cause and effect. Collocations and idioms, commonly used expressions. Exceptions to word order. Phrasal verbs and their usage. Characteristics of formal and informal discourse. Group discussion and debate on selected topics.	
<b>Recommended literature:</b> <a href="http://www.bbclearningenglish.com">www.bbclearningenglish.com</a> Štěpánek, Libor a kol. Academic English-Akademická angličtina. Praha: Grada Publishing, a.s., 2011. McCarthy M., O'Dell F.: English Vocabulary in Use, Upper-Intermediate. CUP, 1994. Fictumova J., Ceccarelli J., Long T.: Angličtina, konverzace pro pokročilé. Barrister and Principal, 2008. Peters S., Gráf T.: Time to practise. Polyglot, 2007.	

Jones L.: Communicative Grammar Practice. CUP, 1985.

Additional study materials.

**Course language:**

English language, B2-C1 level according to CEFR

**Notes:**

**Course assessment**

Total number of assessed students: 332

A	B	C	D	E	FX
43.37	21.99	16.27	7.83	6.33	4.22

**Provides:** Mgr. Barbara Mitříková, Mgr. Viktória Mária Slovenská, Mgr. Simona Martončíková

**Date of last modification:** 02.04.2026

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> CJP/ PFAJGA/07	<b>Course name:</b> Communicative Grammar in English
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Active classroom participation (maximum 2 absences tolerated), homework assignments completed by given deadlines. Presentation of a topic related to the study field. Final Test - end of semester, no retake Final assessment = average of test and presentation. Grading scale: A 93-100%, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64% and less	
<b>Learning outcomes:</b> The development of students' language skills - reading, writing, listening, speaking, improvement of their communicative linguistic competence. Students acquire knowledge of selected phonological, lexical and syntactic aspects, development of pragmatic competence. Students can effectively use the language for a given purpose, with focus on Academic English and English on level B2.	
<b>Brief outline of the course:</b> Selected aspects of English grammar and pronunciation Word formation Contrast of tenses in English The passive voice Types of Conditionals Phrasal verbs and English idioms Words order and collocations, prepositional phrases	
<b>Recommended literature:</b> Vince M.: Macmillan Grammar in Context, Macmillan, 2008 McCarthy, O'Dell: English Vocabulary in Use, CUP, 1994 <a href="http://www.linguahouse.com">www.linguahouse.com</a> <a href="http://esllibrary.com">esllibrary.com</a> <a href="http://bbclearningenglish.com">bbclearningenglish.com</a> <a href="http://ted.com/talks">ted.com/talks</a>	
<b>Course language:</b>	

English language, level B2 according to CEFR.					
<b>Notes:</b>					
<b>Course assessment</b>					
Total number of assessed students: 456					
A	B	C	D	E	FX
41.23	19.52	15.79	7.89	5.92	9.65
<b>Provides:</b> Mgr. Viktória Mária Slovenská					
<b>Date of last modification:</b> 02.02.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> KGER/ NJKG/07	<b>Course name:</b> Communicative Grammar in German Language
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Active participation in class and completed homework assignments. Students are allowed to miss 2 classes at the most (2x90 min.). 2 control tests during the semester. Final grade will be calculated as follows: A 93-100 %, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64 % and less.	
<b>Learning outcomes:</b> The aim of the course is to identify and eliminate the most frequent grammatical errors in oral and written communication, learning language skills of listening comprehension, speaking, reading and writing, increasing students' language competence (acquisition of selected phonological, lexical and syntactic knowledge), development of students' pragmatic competence (acquisition of the ability to express selected language functions), development of presentation skills, etc.	
<b>Brief outline of the course:</b> The course is aimed at practicing and consolidating knowledge of morphology and syntax of German in order to show the context in grammar as a whole. The course is intended for students who often make grammatical errors in oral as well as written communication. Through the analysis of texts, audio recordings, tests, grammar exercises, monologic and dialogical expressions of students focused on specific grammatical structures, problematic cases are solved individually and in groups. Emphasis is placed on the balanced development of grammatical thinking in the communication process, which ultimately contributes to the development of all four language skills.	
<b>Recommended literature:</b> Dreyer, H. – Schmitt, R.: Lehr- und Übungsbuch der deutschen Grammatik. Hueber Verlag GmbH & Co. Ismaning, 2009. Krüger, M.: Motive Kursbuch, Lektion 1 – 30. Huebert Verlag GmbH & Co. Ismaning, 2020. Brill, L.M. – Techmer, M.: Deutsch. Großes Übungsbuch. Wortschatz. Huebert Verlag GmbH & Co. Ismaning, 2011. Földeak, Hans: Sag's besser!. Grammatik. Arbeitsbuch für Fortgeschrittene. Huebert Verlag GmbH & Co. Ismaning, 2001. Geiger, S. – Dinsel, S.: Deutsch Übungsbuch Grammatik A2-B2. Huebert Verlag GmbH & Co. Ismaning, 2018. Dittelová, E. – Zaváčanová, M.: Einführung in das Studium der deutschen Fachsprache. Košice: ES UPJŠ, 2000.	

Dintera,H./Steinmetz, M: Deutsch für Ingenieure. Ilmenau 2018.					
<b>Course language:</b> German, Slovak language					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 60					
A	B	C	D	E	FX
63.33	10.0	8.33	3.33	8.33	6.67
<b>Provides:</b> Mgr. Ulrika Strömplová, PhD.					
<b>Date of last modification:</b> 16.09.2025					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ FKP/26	<b>Course name:</b> Complex analysis
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 6.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/MAN1c/22 or ÚMV/MAN2d/22 or ÚMV/FRPb/19	
<b>Conditions for course completion:</b> Two written test during semester and activity student to practice. Final evaluation is given by continuous assessment, written and oral part of the exam.	
<b>Learning outcomes:</b> The purpose of the course is to provide introductory knowledge in differential and integral calculus of complex functions and develop the ability to use this theory.	
<b>Brief outline of the course:</b> Complex numbers, complex sequences and series. Function of a complex variable - limits, continuity, differentiability, Cauchy-Riemann equations. Integration in the complex plane - Cauchy's theorems and its consequences. Laurent's series, residues and Cauchy's residue theorem. Laplace and Fourier transform and their applications.	
<b>Recommended literature:</b> 1. Kľuvánek, I. - Mišík, L. - Švec, M.: Matematika II; SVTL, Bratislava, 1959. 2. Galajda, P. - Schrötter, Š.: Funkcia komplexnej premennej a operátorový počet. ALFA, Bratislava, 1991. 3. Privalov, I. I.: Analytické funkce. Nakladatelství ČAV, Praha, 1955. 4. Demidovič, B. P.: Sbíрка úloh a cvičení z matematické analýzy, Fragment, Praha, 2003. 5. Eliaš, J. - Horváth, J. - Kajan, J.: Zbierka úloh z vyššej matematiky 2, 3, 4, Alfa, Bratislava, 1971. 6. Priestley, H.A.: Introduction to Complex Analysis. Oxford University Press, Oxford, 2004. 7. Sveshnikov, A. - Tikhonov, A.: The Theory of Functions of a Complex Variable. Mir Publishers, Moscow, 1973.	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 72					
A	B	C	D	E	FX
20.83	9.72	29.17	9.72	20.83	9.72
<b>Provides:</b> prof. RNDr. Ondrej Hutník, PhD.					
<b>Date of last modification:</b> 26.02.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ TVY/15	<b>Course name:</b> Computability theory
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I., II., N	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Two written examinations focused on the construction of Turing machines, creating sequences of (primitive) recursive functions, solving examples. Oral exam focused on the relationship between classes of recursive and computable functions, the problem of stopping a Turing machine.	
<b>Learning outcomes:</b> Knowledge of computational model of Turing machine, Goedelian arithmetization, and relationship between Turing computability and recursivity of functions.	
<b>Brief outline of the course:</b> <ol style="list-style-type: none"> <li>1. Turing machine, basic principles of work of Turing machine, formalization of basic notions</li> <li>2. Shifting of states, compositions of machines, computations on composed machines</li> <li>3. Modifications of configuration</li> <li>4. Elementary Turing machines</li> <li>5. Compositions of elementary Turing machines</li> <li>6. Primitively recursive functions</li> <li>7. Primitively recursive predicates</li> <li>8. Functions and predicates from number theory</li> <li>9. Goedelian arithmetization of Turing computability</li> <li>10. Recursive functions</li> <li>11. Relationship of recursivity and Turing computability</li> <li>12. Halting problem</li> </ol>	
<b>Recommended literature:</b> <ol style="list-style-type: none"> <li>1. BRIDGES, Douglas. Computability, A Mathematical Sketch book. Springer--Verlag, 1994. ISBN:: 978-0387941745</li> <li>2. BUKOVSKÝ, Lev. Teória algoritmov, ES UPJŠ, Košice, 1999. ISBN 8070973730</li> <li>3. MACHTEY, Michael a Paul YOUNG. An Introduction to the General Theory of Algorithms, North--Holland, Amsterdam 1978.</li> <li>4. KRAJČI, Stanislav. Teória vypočítateľnosti. <a href="http://ics.upjs.sk/~krajci/skola/vyucba/ucebneTexty/vypocitatelnost.pdf">http://ics.upjs.sk/~krajci/skola/vyucba/ucebneTexty/vypocitatelnost.pdf</a></li> </ol>	
<b>Course language:</b>	

Slovak					
<b>Notes:</b>					
<b>Course assessment</b>					
Total number of assessed students: 361					
A	B	C	D	E	FX
55.12	11.36	10.8	4.71	4.71	13.3
<b>Provides:</b> doc. RNDr. Ľubomír Antoni, PhD.					
<b>Date of last modification:</b> 04.01.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ KOP/10	<b>Course name:</b> Convex programming
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 / 1 <b>Per study period:</b> 42 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 6.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/LCO/10 and (ÚMV/MAN1c/22 or ÚMV/MAN2d/22 or ÚMV/FRPb/19)	
<b>Conditions for course completion:</b> To complete the course, it is necessary to demonstrate the ability to formulate definitions and theorems from the lectured material, to demonstrate the proofs of theorems and to solve selected problems of convex resp. nonlinear programming. The overall evaluation of the course is awarded on the basis of semester evaluation (which includes the completion of two semester tests focusing on problem solving; for each of them, a maximum of 25 points can be obtained) and the results of an oral exam (consisting of three questions of a theoretical nature, with a total of 50 points). To pass the exam, it is necessary to obtain more than half of the maximum number of 100 points (otherwise the test is evaluated by FX), whereby evaluation E is given in case of point gain 51-59, D in case of 60-69, C in case of 70-79, B in the case of 80-89 and A in the case of more than 90 points.	
<b>Learning outcomes:</b> After completing the course, the student is acquainted with the basics of nonlinear programming from both theoretical point of view (the topics include properties of convex sets, properties of convex functions, optimality conditions for nonlinear problems, Karush-Kuhn-Tucker theory, quadratic programming), as well as from practical one (illustrations of real problems with underlying models that use nonlinear programming, and methods of their solution using computer algebra systems and computer technology).	
<b>Brief outline of the course:</b> Week 1: Practical problems leading to nonlinear programs. Week 2 - 3: Convex sets and their properties. Week 4 - 6: Convex functions – properties and criteria of convexity. Week 7 - 8: Necessary and sufficient conditions of optimality. Karush-Kuhn-Tucker conditions. Week 9 - 10: Quadratic programming. Duality in nonlinear programming.	
<b>Recommended literature:</b> M. Hamala, M. Trnovská: Nelineárne programovanie, Epos, 2012 M.S. Bazaraa, H.D. Sherali, C.M. Shetty: Nonlinear Programming: Theory and Algorithms, 3rd edition, Wiley-Interscience, 2006	

<b>Course language:</b> Slovak or English					
<b>Notes:</b> Knowledge of the basics of differential calculus of functions of one and more variables, linear algebra and linear programming (simplex method) is required.					
<b>Course assessment</b> Total number of assessed students: 96					
A	B	C	D	E	FX
15.63	13.54	10.42	12.5	47.92	0.0
<b>Provides:</b> prof. RNDr. Tomáš Madaras, PhD., RNDr. Alfréd Onderko, PhD.					
<b>Date of last modification:</b> 19.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ ADA/19	<b>Course name:</b> Data analysis
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 1 / 3 <b>Per study period:</b> 14 / 42 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/UAD/10	
<b>Conditions for course completion:</b> Test (30p) and individual project work (20p). Oral presentation of the individual project work (5p). At least 50% must be obtained from each part. Final evaluation: $\geq 90\%$ A; $\geq 80\%$ B; $\geq 70\%$ C; $\geq 60\%$ D; $\geq 50\%$ E; $< 50\%$ FX.	
<b>Learning outcomes:</b> Students will gain practical skills in applying basic statistical methods of estimating and testing on real data using statistical software. At the same time, they will develop a concrete idea of the basic statistical concepts and methods discussed from a theoretical point of view in the following subjects.	
<b>Brief outline of the course:</b> 1. Data visualization using statistical software R. 2. Basic principles of statistical inference. Random sample from normal distribution, q-q plot, testing of normality. 3. Confidence intervals for proportions. 4. Confidence intervals for means. 5. Testing hypotheses about proportions. 6. Testing hypotheses about means. 7. Relationships between quantitative variables. Linear regression, multiple regression. 8. Data visualization using Python (part I). 9. Relationships between qualitative variables. Goodness-of-Fit tests and contingency tables. 10. Analysis of variance (principle, testing, graphical representation). 11. Data visualization using Python (part II). 12. Nonparametric methods of testing.	
<b>Recommended literature:</b> 1. Utts, J.M., Heckard, R.F. (2021), Mind od Statistics, 6th ed., Thomson Brooks/Cole 2. Peck, R., Short, T. (2019), Statistics: Learning from Data, 2nd ed., Cengage Learning 3. Crawley, M.J. (2014), Statistics: An Introdtion using R, New York: Wiley 4. Wickham, H. (2016), ggplot2: Elegant Graphics for Data Analysis, 2nd ed. Springer 5. VanderPlas, J. (2023), Python Data Science Handbook, O'Reilly Media 6. Anděl J. (2011): Základy matematické statistiky, MatfyzPress, Praha (in Czech)	

<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 96					
A	B	C	D	E	FX
61.46	16.67	14.58	4.17	1.04	2.08
<b>Provides:</b> doc. RNDr. Martina Hančová, PhD.					
<b>Date of last modification:</b> 21.11.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ DSMa/10	<b>Course name:</b> Discrete mathematics I
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Examination.	
<b>Learning outcomes:</b> To be familiar with some factual knowledge of combinatorics and graph theory. To understand and appreciate mathematical notions, definitions, and proofs, to solve problems requiring more than just standard recipes, and to express mathematical thoughts precisely and more rigorously.	
<b>Brief outline of the course:</b> Basic principles. Counting and binomial coefficients, Binomial theorem, polynomial theorem. Recurrence: Some miscellaneous problems, Fibonacci-type relations, Using generating functions, miscellaneous methods. The inclusion-exclusion principle. Rook polynomials. Introduction to graphs: The concept of graphs, paths in graphs. Connectivity. Trees, bipartite graphs. Planarity. Polyhedra. Traveling round a graph: Eulerian graphs, Hamiltonian graphs. Partitions and colourings: Vertex colourings of graphs. Edge colourings of graphs	
<b>Recommended literature:</b> 1. I. Anderson, A first course in discrete mathematics, Springer-Verlag London, 2001. 2. J. Matoušek and J. Nešetřil, Invitation to discrete mathematics, Oxford University Press Inc. , New York 1999. 3. S. Jendroľ, P. Mihók: Diskrétna matematika I, UPJŠ Košice 1992.	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 481					
A	B	C	D	E	FX
19.75	20.58	23.28	20.37	13.51	2.49
<b>Provides:</b> doc. RNDr. Roman Soták, PhD., RNDr. Alfréd Onderko, PhD.					
<b>Date of last modification:</b> 16.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ DSMb/10	<b>Course name:</b> Discrete mathematics II
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 2.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/DSMa/10 or ÚMV/DSM3a/10	
<b>Conditions for course completion:</b> In the covered areas of graph theory, the ability to formulate definitions and statements, to present proofs of statements, to explain individual steps in proofs and to solve selected problems related to given topics is required. During the semester (continuous assessment) two tests take place, from which 50% of points can be obtained, and from the oral exam alike 50% can be obtained. Evaluation: A ... at least 90%, B ... at least 80%, C ... at least 70%, D ... at least 60%, E ... at least 50%, FX ... less than 50% .	
<b>Learning outcomes:</b> Acquired knowledge of basic areas of graph theory, overview of used objects and properties, understanding of important statements and methods, knowledge of possible applications and the ability to formulate and solve problems in this area.	
<b>Brief outline of the course:</b> - (week 1) Introduction to graphs (graph relations, graph operations, special graph classes) - (week 2-3) Connectivity and distance in graphs (connectedness of vertices, eccentricity, incidence matrix) - (week 4) (Spanning) Trees (trees isomorphism) - (week 5-6) Connectivity in graphs (vertex and edge k-connectedness) - (week (7-8) Independence and coverings (independent set, matching, vertex and edge covering) - (week 9-10) Extremal graph theory (Ramsey numbers, Turán graphs) - (week 11-13) Graph colorings (vertex coloring, chromatic polynomial, edge coloring) - (week 14) Directed graphs (strong/weak connectedness, tournaments, acyclic graphs)	
<b>Recommended literature:</b> 1. A. Bondy, U.S.R. Murty, Graph theory, Springer, 2008 2. G. Chartrand, L. Lesniak, P. Zhang, Graphs and digraphs, CRC Press, 2011 3. R. Diestel, Graph Theory, Springer, 2017 4. D. West, Introduction to Graph Theory, Pearson, 2001	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 237					
A	B	C	D	E	FX
14.77	13.08	24.47	24.89	18.14	4.64
<b>Provides:</b> RNDr. Igor Fabrici, Dr. rer. nat., RNDr. Alfréd Onderko, PhD.					
<b>Date of last modification:</b> 16.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ DSMc/10	<b>Course name:</b> Discrete mathematics III
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 3.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/DSMb/10	
<b>Conditions for course completion:</b> To complete the course, it is necessary to demonstrate the ability to formulate definitions and statements from the lectured material, to understand the relationship between them, to demonstrate the proofs of statements and solve selected problems based on the presented areas of graph theory. The course evaluation is based on the continuous assessment and the results of the exam consisting of a final test and a part. Continuous assessment takes place in the form of two written tests (focused on the lecture task) during the semester; each of them can be awarded a maximum of 25 points. The exam will consist of a test (from which a maximum of 25 points can be awarded, and in terms of content and scope it will be similar to the test from the semester part) and an oral answer (to two questions with a maximum of 15 and 10 points respectively). The summary assessment is given by the sum of the points obtained for the semester part and the exam (the maximum possible score is 100 points). To pass the exam, it is necessary to obtain a total of at least 51 points (otherwise the exam is assessed as FX), with the grade E being awarded for points of 51-59, D for 60-69, C for 70-79, B for 80-89 and A for over 90 points.	
<b>Learning outcomes:</b> After completing the course, the student is acquainted (following the prerequisite subject Discrete Mathematics I and II) with other core topics and results of graph theory, which will give the comprehensive insight and knowledge of this area of mathematics.	
<b>Brief outline of the course:</b> Week 1: Advanced graph models of structures from different areas of science. Week 1 and 2: Eulerian and hamiltonian graphs. Week 3 and 4: Measures of connectivity in graphs, Menger theorem and its corollaries. Week 5: Perfect matchings, Tutte theorem. Week 6 and 7: Planar graphs and their basic properties, Euler formula and its corollaries. Week 8: Characterization of planar graphs, theorem of Kuratowski. Week 9: Structural properties of planar and polyhedral graphs. Week 10: Chromaticity of planar graphs. Week 11: Measures of graph nonplanarity I - crossing number and its estimates, crossing lemma. Week 12: Measures of graph nonplanarity II - the genus of graph, Eulerova theorem for embedded graphs, chromaticity of embedded graphs.	

Week 13: Edge colorings, Vizing theorem					
<b>Recommended literature:</b> D.B. West: Introduction to graph theory (2nd edition), Prentice Hall 2001 A. Bondy and U.S.R. Murty: Graph theory, Springer-Verlag 2008 G. Chartrand, L. Lesniak, and P. Zhang, Graphs and digraphs, CRC Press 2011 R. Diestel: Graph Theory (4th edition), Springer-Verlag 2010					
<b>Course language:</b> Slovak or English					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 96					
A	B	C	D	E	FX
18.75	29.17	14.58	23.96	13.54	0.0
<b>Provides:</b> prof. RNDr. Tomáš Madaras, PhD., RNDr. Alfréd Onderko, PhD.					
<b>Date of last modification:</b> 09.09.2025					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ DSMd/25	<b>Course name:</b> Discrete mathematics IV
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/DSMc/10	
<b>Conditions for course completion:</b> In the covered areas of graph theory, the ability to formulate definitions and statements, to present proofs of statements, to explain individual steps in proofs and to solve selected problems related to given topics is required. Evaluation: A ... at least 90%, B ... at least 80%, C ... at least 70%, D ... at least 60%, E ... at least 50%, FX ... less than 50% .	
<b>Learning outcomes:</b> Acquired knowledge of algebraic graph theory and the probabilistic method in graph theory, understanding of important statements and methods and the ability to solve other problems in this area.	
<b>Brief outline of the course:</b> <ul style="list-style-type: none"> <li>- Graph automorphisms, orbits</li> <li>- Spectrum of a graph, characteristic polynomial</li> <li>- Properties of vertex- (edge-) transitive graphs</li> <li>- Permutation group, stabilizer of an object, set of fixed points of a permutation</li> <li>- Burnside's lemma, Pólya's enumeration theorem</li> <li>- Inventory of n-vertex graphs</li> <li>- Probabilistic method in graph theory</li> </ul>	
<b>Recommended literature:</b> 1. J.L. Gross, J. Yellen: Graph Theory and its Applications, Chapman&Hall, 2006, 2. J.M. Harris, J.L. Hirst, M.J. Mossinghoff, Combinatorics and Graph Theory, Springer, 2008 3. N. Biggs, Algebraic Graph Theory, Cambridge University Press, 1993 4. J. Matoušek, J. Vondrák, The Probabilistic Method, Lecture Notes, 2002	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 53					
A	B	C	D	E	FX
26.42	13.21	30.19	11.32	18.87	0.0
<b>Provides:</b> RNDr. Igor Fabrici, Dr. rer. nat.					
<b>Date of last modification:</b> 12.01.2025					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ DYS/19	<b>Course name:</b> Dynamic systems
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/MANb/19 or ÚMV/MAN2b/22 or ÚMV/FRPb/19	
<b>Conditions for course completion:</b> Ongoing evaluation takes the form of a written test during the semester. The overall evaluation is based on a result of mid-term evaluation (60%) and the result of final written and oral examination (40%).	
<b>Learning outcomes:</b> The course provides students deep knowledge of the theory of dynamical systems from the theoretical and practical point of view (their modeling, their properties and numerical simulation). Emphasis is put on an interdisciplinary approach and the usage of software.	
<b>Brief outline of the course:</b> 1. Basic notions of the theory of dynamical systems and their properties. 2. Differential equations of n-th order and systems of differential equations - their relationship, methods of solution. 3. Difference equations and systems - methods of solution. 4. Existence, uniqueness and continuation of Cauchy problem. 5. Stability and chaotic behavior of the dynamical systems, bifurcation. 6. Numerical methods as dynamical systems, analysis of algorithms. 7. Applications of dynamical systems in computer science.	
<b>Recommended literature:</b> 1. Brunovský, P. , Diferenčné a diferenciálne rovnice (vysokoškolský učebný text), FMFI UK, 2011 <a href="http://www.iam.fmph.uniba.sk/skripta/brunovsky/ddrtext.pdf">http://www.iam.fmph.uniba.sk/skripta/brunovsky/ddrtext.pdf</a> 2. L. Kluvánek, I. Mišík, M. Švec: Matematika II, SVTL, Bratislava, 1961. 3. N. M. Matvejev: Zbierka príkladov z obyčajných diferenciálnych rovníc, ALFA, Bratislava, 4. Stuart, A.M.; Humphries, A.R. (1996), Dynamical Systems and Numerical Analysis, Cambridge University Press 5. Jacques M. Bahi and Christophe Guyeux. 2013. Discrete Dynamical Systems and Chaotic Machines: Theory and Applications. CRC Press, Inc., Boca Raton, FL, USA. 1970. 6. Kelley, C. T. (1995). Iterative Methods for Linear and Nonlinear Equations. SIAM. 7. Kelley, C.T. (1999) Iterative Methods for Optimization. In: Frontiers in Applied Mathematics, Vol. 18, SIAM	

<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 187					
A	B	C	D	E	FX
22.46	21.93	14.97	21.39	16.04	3.21
<b>Provides:</b> doc. Mgr. Jozef Kiseľák, PhD.					
<b>Date of last modification:</b> 15.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ BSE/25		<b>Course name:</b> Economic models			
<b>Course type, scope and the method:</b> <b>Course type:</b> <b>Recommended course-load (hours):</b> <b>Per week: Per study period:</b> <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 4					
<b>Recommended semester/trimester of the course:</b>					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/MAN1d/22 and ÚMV/TPP/19 and ÚMV/MST/19 and ÚMV/FMT/10 and ÚMV/ZIP/10 and ÚMV/LCO/10					
<b>Conditions for course completion:</b>					
<b>Learning outcomes:</b>					
<b>Brief outline of the course:</b>					
<b>Recommended literature:</b>					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 0					
A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0
<b>Provides:</b>					
<b>Date of last modification:</b> 27.03.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> CJP/ PFAJ4/07	<b>Course name:</b> English Language of Natural Science
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 2.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Active participation in class and completed homework assignments. Students are allowed to miss 2 classes at the most Continuous assessment: 1 credit test taken presumably in weeks 6/7 1 project (quiz on the topic of the student's field of study) 25% of the continuous assessment 5 LMS quizzes (25% of the continuous assessment) In order to be admitted to the final exam, a student has to score at least 65 % from the continuous assessment The exam test results represent 50% of the final grade for the course, continuous assessment results represent the other 50% of the final grade. The final grade for the course will be calculated as follows: A 93-100, B 86-92, C 79-85, D 72-78, E 65-71, FX 64 and less.	
<b>Learning outcomes:</b> Enhancement of students' language skills (speaking, writing, reading and listening comprehension) in English for specific and academic purposes and development of students' linguistic competence. Students obtain knowledge of selected phonological, lexical and syntactic aspects of professional English, improve their pragmatic competence - students can effectively use the language for a given purpose, and acquire presentation skills at B2 level (CEFR) with focus on terminology of natural sciences.	
<b>Brief outline of the course:</b> 1. Introduction to studying language 2. Selected aspects of scientific language 3. Talking about academic study 4. Discussing science 5. Defining scientific terminology and concepts 6. Expressing cause and effect 7. Describing structures 8. Explaining processes 9. Comparing objects, structures and concepts	

10. Talking about problem and solution 11. Referencing authors 12. Giving examples 13. Visual aids and numbers 14. Referencing time and place Presentation topics related to students' study fields.					
<b>Recommended literature:</b> lms.upjs.sk - e-kurz Odborný anglický jazyk pre prírodné vedy. Redman, S.: English Vocabulary in Use, Pre-intermediate, Intermediate. Cambridge University Press, 2003. Armer, T.: Cambridge English for Scientists. CUP, 2011. Wharton J.: Academic Encounters. The Natural World. CUP, 2009. P. Fitzgerald : English for ICT studies. Garnet Publishing, 2011. <a href="https://worldservice/learningenglish">https://worldservice/learningenglish</a> , <a href="https://spectator.sme.sk">https://spectator.sme.sk</a> <a href="http://www.isllibrary.com">www.isllibrary.com</a> <a href="http://linguahouse.com">linguahouse.com</a>					
<b>Course language:</b> English, level B2 (CEFR)					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 3392					
A	B	C	D	E	FX
38.15	26.59	16.72	9.49	6.99	2.06
<b>Provides:</b> Mgr. Viktória Mária Slovenská, Mgr. Simona Martončíková					
<b>Date of last modification:</b> 02.02.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ FMT/10		<b>Course name:</b> Financial mathematics			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 4					
<b>Recommended semester/trimester of the course:</b> 3.					
<b>Course level:</b> I.					
<b>Prerequisites:</b>					
<b>Conditions for course completion:</b> Two tests during the semester. Final evaluation based on written tests and oral exam.					
<b>Learning outcomes:</b> Knowledge of the basics of financial mathematics.					
<b>Brief outline of the course:</b> Financial systems and their structure. Simple, compound and continuous interesting and discounting. The time value of money, inflation and taxes. Cash flows, their present and future value. Annuities, savings and loan amortizations. The time structure of interest rates, yield curves. Analysis of investments, decisional criteria and techniques of valuation and comparison of financial projects. Stocks and bonds, their valuation, duration and konvexity. Immunization of portfolio. Financial derivatives, business strategies.					
<b>Recommended literature:</b> 1. Skřivánková V.-Skřivánek J.: Kvantitativne metódy finančných operácií, IURA Edition, Bratislava, 2006. 2. Capiński M., Zastawniak T.: Mathematics for Finance, Springer, London, 2011. 3. Lovelock at al.: An Introduction to the Mathematics of Money, Springer, London, 2007. 4. Janssen at al.: Mathematical Finance, ISTE / Wiley, 2009.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 68					
A	B	C	D	E	FX
8.82	13.24	26.47	23.53	20.59	7.35
<b>Provides:</b> Mgr. Katarína Lučivjanská, PhD.					
<b>Date of last modification:</b> 16.04.2022					

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ FRPa/19	<b>Course name:</b> Function of real variable
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 4 <b>Per study period:</b> 28 / 56 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 7	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Continuous assessment of student's work during the semester (submission of compulsory homework, writing three tests). Final test and oral discussion on the topics of the subject.	
<b>Learning outcomes:</b> The course provides an introductory knowledge on basic tools of differential and integral calculus of real functions of one real variable, and a development of certain calculation skills in the field.	
<b>Brief outline of the course:</b> 1. Basics of mathematical logic and notations (1 week) 2. Real functions - basic notions, operation, graphs and their transformations (2 weeks) 3. Continuity of a real-valued function (1 week) 4. Derivative of a function using the geometric concepts, rules of differentiation (2 weeks) 5. Basic of differential calculus - relations with monotonicity and convexity, extremas, using in optimisation, geometric and physics tasks (2 weeks) 6. Primitive function, methods of their finding (3 weeks) 7. Newton definite integral - methods of its computation, using in geometric and physics tasks (2 weeks)	
<b>Recommended literature:</b> 1. Kulcsár, Š. - Kulcsárová, O.: Zbierka úloh z matematickej analýzy I., UPJŠ, 2002. 2. Kulcsár, Š. - Kulcsárová, O.: Zbierka úloh z matematickej analýzy II., UPJŠ, 2003. 3. Hutník, O. - Kulcsár, Š. - Kulcsárová, O. - Mojsej, I.: Zbierka úloh z matematickej analýzy III., UPJŠ, 2011. 4. Demidovič, B. P.: Sbírka úloh a cvičení z matematické analýzy, Fragment, Praha, 2003. 5. Brannan, D.: A First Course in Mathematical Analysis, Cambridge University Press, Cambridge 2006. 6. Bruckner, A. M., Bruckner J. B., Thomson, B. S.: Real Analysis, Second Edition, ClassicalRealAnalysis.com, 2008. 7. Zorich, V. A.: Mathematical Analysis I, Springer-Verlag 2002.	
<b>Course language:</b> Slovak	

<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 1051					
A	B	C	D	E	FX
8.56	7.71	16.84	19.79	27.78	19.31
<b>Provides:</b> prof. RNDr. Ondrej Hutník, PhD., RNDr. Lenka Halčinová, PhD., RNDr. Jana Borzová, PhD., Mgr. Natália Puškárová					
<b>Date of last modification:</b> 16.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ GEO1a/22	<b>Course name:</b> Geometry I
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 4 / 2 <b>Per study period:</b> 56 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 7	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/ALG1b/24	
<b>Conditions for course completion:</b> According to exams (focused on solving exercises) and activity during the term, written exam and oral exam. The exam consist of showing the ability to use the knowledge to solve exercises, ability to define the terms from lessons, state and prove propositions and theorems. Scale: 0-50 Fx, 51-60 E, 61-70 D, 71-80 C, 81-90 B, 91-100 A.	
<b>Learning outcomes:</b> Acquaintancing with Euclidean spaces and with geometric objects in these spaces. Obtaining a deeper knowledge on basic properties of geometric objects and transformations. Developing spatial imagination.	
<b>Brief outline of the course:</b> <ul style="list-style-type: none"> <li>- Euclidean spaces, the distance and angle of subspaces. (3 weeks)</li> <li>- The measure of angle and the volume of convex polyhedron. (1 week)</li> <li>- Geometry of the triangle. (1 week)</li> <li>- Curves and surfaces of second order. (4 weeks)</li> <li>- Affine transformations. (2 weeks)</li> <li>- Isometric transformations and similitudes. (3 weeks)</li> </ul>	
<b>Recommended literature:</b> 1. M. Sekanina a kol.: Geometrie 1, SPN Praha 1986 2. M. Sekanina a kol.: Geometrie 2, SPN Praha 1988 3. M. Hejný a kol. : Geometria 1, SPN Bratislava 1985 4. O. Šedivý a kol. : Geometria 2, SPN Bratislava 1987 5. A. F. Beardon: Algebra and geometry, Cambridge University Press, 2005	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 115					
A	B	C	D	E	FX
13.91	16.52	9.57	22.61	37.39	0.0
<b>Provides:</b> Mgr. Martin Vodička, Dr. rer. nat.					
<b>Date of last modification:</b> 08.06.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ GEO1b/22	<b>Course name:</b> Geometry II
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 / 1 <b>Per study period:</b> 42 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/GEO1a/22 and ÚMV/MAN1c/22	
<b>Conditions for course completion:</b> According to exams (focused on solving exercises) and activity during the term, written exam and oral exam. The exam consist of showing the ability to use the knowledge to solve exercises, ability to define the terms from lessons, state and prove propositions and theorems. Scale: 0-50 Fx, 51-60 E, 61-70 D, 71-80 C, 81-90 B, 91-100 A.	
<b>Learning outcomes:</b> Obtaining a deeper knowledge on curves and surfaces in Euclidean spaces. Familiarizing with these properties mainly with use of methods of differential calculus. Learning about out some practical applications.	
<b>Brief outline of the course:</b> - Plane curves and space curves. The tangent line, the osculating plane. The curvature and torsion of a curve. (6 weeks) - Frenet formulas. (2 weeks) - The theory of surfaces, fundamental forms. (4 weeks) - Regular mappings on surfaces. (1 week)	
<b>Recommended literature:</b> 1. B. Budinský: Analytická a diferenciální geometrie, SNTL Praha 1983 2. M. Sekanina a kol.: Geometrie 2, SPN Praha 1988 3. O. Šedivý a kol.: Geometria 2, SPN Bratislava 1987 4. Ch. Hsiung: A First Course in Differential Geometry, Cambridge 1997 5. W. Kuhnel: Differential Geometry Curves-Surfaces-Manifolds, AMS 2002	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 55					
A	B	C	D	E	FX
14.55	16.36	14.55	20.0	32.73	1.82
<b>Provides:</b> RNDr. Lucia Kőszegyová, PhD.					
<b>Date of last modification:</b> 08.06.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> Dek. PF UPJŠ/USPV/13	<b>Course name:</b> Introduction to Study of Sciences
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week: Per study period:</b> 12s / 3d <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b>	
<b>Learning outcomes:</b>	
<b>Brief outline of the course:</b>	
<b>Recommended literature:</b>	
<b>Course language:</b>	
<b>Notes:</b>	
<b>Course assessment</b>	
Total number of assessed students: 2593	
abs	n
90.98	9.02
<b>Provides:</b> doc. RNDr. Marián Kireš, PhD.	
<b>Date of last modification:</b> 30.08.2022	
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.	

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ UAD/10	<b>Course name:</b> Introduction to data analysis
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 1 / 1 <b>Per study period:</b> 14 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Test (40p) and individual project work (20p). Oral presentation of the individual project work (5p). At least 50% must be obtained from each part. Final evaluation: $\geq 90\%$ A; $\geq 80\%$ B; $\geq 70\%$ C; $\geq 60\%$ D; $\geq 50\%$ E; $< 50\%$ FX.	
<b>Learning outcomes:</b> To know the basic purpose of statistical data analysis, its methods and statistical thinking and understand its importance for science and practical life. To understand elementary statistical concepts. To gain experience in handling real data using spreadsheet Excel and statistical software R.	
<b>Brief outline of the course:</b> 1. Introduction (the basic philosophy and aim of statistical data analysis, descriptive and inductive statistics) 2. Collecting Data (types of data, random sample, randomized experiment) 3. Handling Data (visualization, summarizing – measures of center, measures of variability, skewness and kurtosis, empirical rule) - 5 weeks 4. Relationships in data (introduction to regression and correlation) - 4 weeks 5. Statistical inference (elementary view into estimation and testing hypothesis) - 2 weeks	
<b>Recommended literature:</b> 1. Rossman, A.J. et al.: Workshop Statistics: Discovery with Data, 4th ed. Wiley, 2011 2. Utts, J.M.: Seeing Through Statistics, 5th ed., Cengage Learning, 2024 3. Utts, J.M., Heckard R.F.: Mind on Statistics, 6th ed.. Cengage Learning, 2021 4. Anděl, J.: Statistické metody, Matfyzpress, 5. vydanie, Praha, 2019 (in Czech)	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 656					
A	B	C	D	E	FX
35.52	23.17	21.95	11.43	1.68	6.25
<b>Provides:</b> doc. RNDr. Martina Hančová, PhD., RNDr. Veronika Jurková, PhD., Mgr. Patrik Štein					
<b>Date of last modification:</b> 21.11.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ USU/19	<b>Course name:</b> Introduction to machine learning
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I., N	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Creating a project focused on the application of machine learning algorithms in a selected application domain. Continuous written work focused on the preparation, processing and interpretation of data using machine learning methods. Successful completion of an oral exam focused on selected machine learning methods.	
<b>Learning outcomes:</b> Theoretical knowledge in the area of machine learning. Basic concepts of machine learning. Basic machine learning algorithms.	
<b>Brief outline of the course:</b> 1. Basic concepts of machine learning. 2. Basic characteristics of data, types of attributes, characteristics for individual attributes, dependence between attributes. 3. Data sources and their acquisition. Determining the target task. 4. Preparation and cleaning of data, missing values, incorrect inputs. 5. Classification tasks 6. Selected classification methods 7. Evaluation of models - true positive, false positive, true negative, false negative examples. 8. Classification accuracy indicators. 9. Cluster analysis. 10. Association rules. 11. Prediction tasks and selected prediction methods 12. Prediction accuracy indicators.	
<b>Recommended literature:</b> 1. AGGARWAL, Charu C. Data mining: a textbook. Cham: Springer, 2015. ISBN 978-3-319-14141-1. 2. ALPAYDIN, Ethem. Introduction to machine learning. 3rd ed. Massachusetts: MIT Press, 2014. ISBN 978-0-262-02818-9. 3. RASCHKA, Sebastian, Mirjalili, Vahid. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2, 3rd Edition, Packt Publishing Ltd., 2019. ISBN 978-1789955750.	

4. WITTEN, I. H., Eibe FRANK a Mark A. HALL. Data mining: practical machine learning tools and techniques. 4th ed. Amsterdam: Morgan Kaufmann, 2017. Morgan Kaufman series in data management systems. ISBN 9780128042915.					
<b>Course language:</b> Slovak or English					
<b>Notes:</b> Content prerequisites: Basics of programming in Python, or another alternative programming language suitable for data analysis					
<b>Course assessment</b> Total number of assessed students: 73					
A	B	C	D	E	FX
84.93	6.85	4.11	2.74	1.37	0.0
<b>Provides:</b> doc. RNDr. Ľubomír Antoni, PhD., Mgr. Barbora Ľapinová					
<b>Date of last modification:</b> 20.09.2021					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ UDM/26	<b>Course name:</b> Introduction to mathematics
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 3	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Two tests during the semester.	
<b>Learning outcomes:</b> Repetition of problematic sections of the secondary mathematics by interesting tasks. Explanation of basic terms, properties and proof methods used in various areas of mathematics.	
<b>Brief outline of the course:</b> Simplification of algebraic expressions. Real number, absolute value of real numbers; equations and inequalities. Irrational equations and inequalities. Concept of function. Linear and quadratic function; equations and inequalities. Exponential and logarithmic function; equations and inequalities. Goniometric functions; equations and inequalities. Complex numbers.	
<b>Recommended literature:</b> 1. V. Medek - L. Mišík - T. Šalát: REPETITÓRIUM STREDOŠKOLSKEJ MATEMATIKY, Alfa Bratislava, 1976 2. S. Richtárová - D. Kyselová: MATEMATIKA (pomôcka pre maturantov a uchádzačov o štúdium na vysokých školách), Enigma Nitra, 1998 3. O. Hudec – Z. Kimáková – E. Švidroňová: PRÍKLADY Z MATEMATIKY (pre uchádzačov o štúdium na TU v Košiciach), EF TU Košice, 1999 4. F. Peller – V. Šáner – J. Eliáš – Ľ. Pinda: MATEMATIKA – Podklady na prijímacie testy pre uchádzačov o štúdium, Ekonóm Bratislava, 2000/2001 5. F. Vesajda – F. Talafous: ZBIERKA ÚLOH Z MATEMATIKY pre stredné všeobecnovzdelávacie školy a gymnáziá, SPN Bratislava, 1973 6. J. Lukášová – O. Odvárko – B. Riečan – J. Šedivý – J. Vyšín: ÚLOHY Z MATEMATIKY pre 4. ročník gymnázia, SPN Bratislava, 1976	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 511					
A	B	C	D	E	FX
23.48	20.74	17.42	16.05	10.96	11.35
<b>Provides:</b> RNDr. Matej Slabý, PhD., RNDr. Enikő Schnürerová					
<b>Date of last modification:</b> 08.04.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ ZIP/10	<b>Course name:</b> Life insurance
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 6.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/MANb/19 and ÚMV/TPP/19	
<b>Conditions for course completion:</b> Given at the basis of partial examination, written part, and oral part of the exam.	
<b>Learning outcomes:</b> Mastering basics of insurance mathematics for life insurance.	
<b>Brief outline of the course:</b> <ul style="list-style-type: none"> <li>• Interest calculus in insurance (compound and continuous interests, annuities and perpetuities)</li> <li>• Mortality modeling               <ul style="list-style-type: none"> <li>o Lifetime, force of mortality, distribution of future lifetime</li> <li>o Curtate and fractional future lifetime</li> <li>o Multiple decrement model</li> <li>o Life tables</li> <li>o Estimation of probabilities of death</li> </ul> </li> <li>• Elementary types of life insurance               <ul style="list-style-type: none"> <li>o Equivalence principle</li> <li>o Life insurance with fixed and varying benefits</li> <li>o Elementary types of life annuities, variable life annuities</li> </ul> </li> <li>• Calculation of premiums               <ul style="list-style-type: none"> <li>o Net premiums</li> <li>o Expense-loaded premiums</li> <li>o Health risks in insurance</li> <li>o Multiple lifes insurance</li> </ul> </li> <li>• Premium reserves               <ul style="list-style-type: none"> <li>o Net premium reserves</li> <li>o Expense-loaded premium reserves</li> </ul> </li> <li>• Reinsurance in life insurance</li> </ul>	
<b>Recommended literature:</b> <ul style="list-style-type: none"> <li>• Cipra: Pojistná matematika. Teorie a praxe., Ekopress, 1999</li> <li>• Gerber: Life insurance mathematics, Springer, 1997</li> <li>• Bowers et al.: Actuarial mathematics, The Society of Actuaries, 1986</li> <li>• Žežula, Cipra, Klein: Životné poistenie, Equilibria, 2022</li> </ul>	

<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 78					
A	B	C	D	E	FX
12.82	23.08	17.95	12.82	23.08	10.26
<b>Provides:</b> prof. RNDr. Ivan Žežula, CSc.					
<b>Date of last modification:</b> 16.10.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ LCO/10		<b>Course name:</b> Linear and integer programming			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 5					
<b>Recommended semester/trimester of the course:</b> 5.					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/ALGa/10					
<b>Conditions for course completion:</b> Continuous evaluation: a small test during each tutorial, two large tests, a project with real data and commercial software. Bonus points awarded for homeworks (formulation of proofs). A necessary condition for final exam is at least 50% of points from th semester. Final exam: demonstrate the understanding of the theory and ability of argumentation.					
<b>Learning outcomes:</b> Ability to formulate practical tasks in a form of a linear program. Proficiency in solving linear programs by several methods, also using software. Understanding of the underlying theory and ability of exact argumentation.					
<b>Brief outline of the course:</b> Formulation of linear and integer programs. Geometric solution. Simplex method, its correctness an finiteness. Duality and its economic interpretation. Dual and revised simplex method. Sensitivity analysis and parametric programming. Algorithms for integer programming: branch and bound, Gomory cuts. Computational complexity of LP and ILP. Solution of practical problems.					
<b>Recommended literature:</b> lms.upjs.sk - podklady k prednáškam a zadania úloh na cvičenia. Plesník, Dupačová, Vlach: Lineárne programovanie, Alfa, Bratislava 1990 Ch. Papadimitriou – K. Steiglitz: Combinatorial Optimization: Algorithms and Complexity, 1984 R.J. Vanderbei, Linear Programming: Foundations and Extentions, Springer 2020, electronic version: <a href="http://www.princeton.edu/~rvdb/LPbook/">http://www.princeton.edu/~rvdb/LPbook/</a>					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 204					
A	B	C	D	E	FX
22.06	17.16	21.08	18.14	19.12	2.45

<b>Provides:</b> prof. RNDr. Katarína Cechlárová, DrSc., Mgr. Juraj Hirjak
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<b>Date of last modification:</b> 17.04.2022
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<b>Approved:</b> doc. RNDr. Roman Soták, PhD.
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## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ LTM/10		<b>Course name:</b> Logic and set theory			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 / 2 <b>Per study period:</b> 42 / 28 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 6					
<b>Recommended semester/trimester of the course:</b> 5.					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/MANb/19 or ÚMV/FRPb/19 or ÚMV/MAN2b/22					
<b>Conditions for course completion:</b> Exam					
<b>Learning outcomes:</b> To obtain a basic knowledge on the mathematical notion of an infinity. Analysis of the notion of a proof.					
<b>Brief outline of the course:</b> Set as a mathematical formularization of an infinity. Properties of the set of reals. Relations and mappings. Finite and countable sets. Cardinality of continuum. Elementary cardinal arithmetics. Sentential calculus, an axiomatization. Completeness Theorem. Methods of proofs. Language of predicate calculus, examples. Axiomatizations of predicate calculus and the notion of a proof. Methods of proofs in predicate calculus.					
<b>Recommended literature:</b> L. Bukovský: Teória množín, ES UPJŠ, Košice, 1984. L. Bukovský: Množiny a všelicho okolo nich, ES UPJŠ, Košice, 2005. L. Bukovský, Úvod do matematickej logiky, elektronický učebný text. A. Sochor: Klasická matematická logika, Karolinum, Praha, 2001. E. Mendelson, Introduction to Mathematical Logic, van Nostrand 1964.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 289					
A	B	C	D	E	FX
13.84	18.34	19.38	16.61	30.1	1.73
<b>Provides:</b> RNDr. Jaroslav Šupina, PhD.					
<b>Date of last modification:</b> 19.04.2022					

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ LOP1/26	<b>Course name:</b> Logic programming
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 <b>Per study period:</b> 42 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 6.	
<b>Course level:</b> I., II.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Evaluation of active participation in exercises and homework, test of theoretical knowledge during the semester. Written and oral exam together with assessment from exercises.	
<b>Learning outcomes:</b> To learn bases of declarative programming (as complementary method to procedural programming) and basic methods of implementations of logic programming languages.	
<b>Brief outline of the course:</b> 1. Introduction to logic 2. theory, models, Herbrand model 3. SLD resolution 4. Basics of Prolog language 5. Prologue in examples 6. Lists 7., 8., 9. Data analysis in Prolog 10., 11., 12. Graph theory in Prolog	
<b>Recommended literature:</b> BRATKO, Ivan. Prolog. Programming for Artificial Intelligence. 2 ed. Wokingham: Addison-Wesley, 1990. ISBN 0-201-41606-9. NILSON U., MALUSINSKI J.: Logic, Programming and Prolog, John Wiley & Sons Ltd. 1995 NIENHUYIS-CHENG Sh.H., WOLF R.: Foundations of Inductive Logic Programming, Springer-Verlag, 1997	
<b>Course language:</b> Slovak or English	
<b>Notes:</b> Prerequisites: none	

<b>Course assessment</b>					
Total number of assessed students: 140					
A	B	C	D	E	FX
35.71	16.43	17.14	17.86	12.14	0.71
<b>Provides:</b> doc. RNDr. Ondrej Kridlo, PhD.					
<b>Date of last modification:</b> 10.01.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ MAE/10		<b>Course name:</b> Macroeconomics			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 4					
<b>Recommended semester/trimester of the course:</b> 3., 5.					
<b>Course level:</b> I.					
<b>Prerequisites:</b>					
<b>Conditions for course completion:</b> The final mark is given based on the results of the tests written during the semester ("small" written exams every week, two written exams checking the ability of computations). The final oral exam evaluates the ability of argumentation about the studied models. The student has to obtain at least 50% of points in the written exams to have the right to take part in the oral exam.					
<b>Learning outcomes:</b> The student understands the basic macroeconomic models and is able to use them to explain the real economic phenomena.					
<b>Brief outline of the course:</b> Basic macroeconomic notions: Gross domestic product, inflation, unemployment.. Analysis of goods markets. Financial markets. IS-LM model in closed economy. Open economy. IS-LM model in open economy. Models of labour market. Inflation and economic growth. High depth.					
<b>Recommended literature:</b> 1. Olivier Blanchard, Alessia Amighini, Francesco Giavazzi, Macroeconomics, a European perspective, Pearson Education, 2021 2. N. Gregory Mankiw, Macroeconomics, 7th Edition, Harvard University, Worth Publishers 2009					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 94					
A	B	C	D	E	FX
28.72	12.77	21.28	18.09	13.83	5.32
<b>Provides:</b> prof. RNDr. Katarína Cechlárová, DrSc.					
<b>Date of last modification:</b> 24.11.2024					

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ MAN1c/22		<b>Course name:</b> Mathematical analysis III			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 4 / 2 <b>Per study period:</b> 56 / 28 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 7					
<b>Recommended semester/trimester of the course:</b> 3.					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/MANb/19					
<b>Conditions for course completion:</b> exam					
<b>Learning outcomes:</b> Understanding of the basic rigorous ideas of Mathematical Analysis.					
<b>Brief outline of the course:</b> Riemann integral. Functional series. Pointwise and uniform convergence. Power series. Fourier series. Euclidean spaces. Limits and continuity of real functions of several variables. Partial derivatives. Implicit function. Inverse mapping. Local, global and constrained extrema.					
<b>Recommended literature:</b> B. S. Thomson, J. B. Bruckner, A. M. Bruckner: Elementary Real Analysis, Prentice Hall, 2001. J. Doboš, M. Záskalická: Zbierka úloh z matematiky III, Elfa, Košice, 2002. Л. Д. Кудрявцев, А. Д. Кутасов, В. И. Чехлов, М. И. Шабунин: Сборник задач по математическому анализу, Наука, Москва, 1995. Qian, Z., Analysis III: Integration, Mathematical Institute, Oxford, 2011.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 136					
A	B	C	D	E	FX
6.62	7.35	12.5	19.12	46.32	8.09
<b>Provides:</b> RNDr. Lenka Halčinová, PhD., prof. RNDr. Ondrej Hutník, PhD.					
<b>Date of last modification:</b> 30.01.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ MAN1d/22	<b>Course name:</b> Mathematical analysis IV
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 4 / 2 <b>Per study period:</b> 56 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 7	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/MAN1c/22 or ÚMV/MAN2c/22	
<b>Conditions for course completion:</b> During the term, each student receives marks for two written exams each worth 25 points. Final marking is assigned based on the overall points for the work throughout the term followed by a written and oral examination where the student can obtain further 30+20 points. Marking classification: A:91%-100%, B:81%-90%, C:71%-80%, D:61%-70%, E:51%-60%, FX:0%-50%	
<b>Learning outcomes:</b> Deepening the knowledge of metric spaces theory, measure theory and Lebesgue integral, which is needed for other disciplines, e.g. probability theory. The student will <ol style="list-style-type: none"> <li>1. familiarise themselves with mathematical culture, ways of thinking, self-expression and putting forward arguments,</li> <li>2. gain a deeper understanding of the base terminology of real analysis, their properties and interconnections,</li> <li>3. be able to define and interpret key terms, prove their basic properties and relationships,</li> <li>4. know how to solve tasks focused on utilising the aforementioned concepts and interpret the obtained results.</li> </ol>	
<b>Brief outline of the course:</b> Metric spaces. Complete, compact and connected sets. Rings sigma-rings. Measure. Outer measure. Lebesgue measure. Measurable sets. Measurable functions. Lebesgue integral. Lebesgue integral versus Riemann integral. Calculations of Lebesgue integrals. Applications.	
<b>Recommended literature:</b> B. S. Thomson, J. B. Bruckner, A. M. Bruckner: Elementary Real Analysis, Prentice Hall, 2001. A. M. Bruckner, J. B. Bruckner, B. S. Thomson: Real Analysis, Prentice Hall, 1997. T. Neubrunn, B. Riečan: Miera a integrál, Veda, Bratislava, 1981. B. Riečan, T. Neubrunn: Teória miery, Veda, Bratislava, 1992. G. S. Nelson, A User-Friendly Introduction to Lebesgue Measure and Integration, American Mathematical Society, 2015	
<b>Course language:</b> Slovak	

<b>Notes:</b>					
<b>Course assessment</b>					
Total number of assessed students: 116					
A	B	C	D	E	FX
5.17	7.76	14.66	17.24	53.45	1.72
<b>Provides:</b> prof. RNDr. Jozef Doboš, CSc., doc. Mgr. Jozef Kiseľák, PhD.					
<b>Date of last modification:</b> 25.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ MANb/19	<b>Course name:</b> Mathematical analysis of function of real variable
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 4 / 3 <b>Per study period:</b> 56 / 42 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 8	
<b>Recommended semester/trimester of the course:</b> 2.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/FRPa/19	
<b>Conditions for course completion:</b> Two written tests during semester and activity student to practice. Final evaluation is given by continuous assessment, written and oral part of the exam.	
<b>Learning outcomes:</b> The purpose of the course is to strengthen the knowledge in differential and integral calculus of real functions of one real variable and to develop computational skills in the field.	
<b>Brief outline of the course:</b> Limit and continuity of real functions, elementary functions. Differential calculus - derivatives of the first and of higher orders, the basic theorems of differential calculus and their use to investigate properties and behavior of functions.	
<b>Recommended literature:</b> 1. Mihalíková, B. - Ohriska, J.: Matematická analýza I (elektronický učebný text), UPJŠ Košice, 2012. 2. Mihalíková, B. - Ohriska, J.: Matematická analýza II (skriptum), ES UPJŠ Košice, 2007. 3. Kluvánek, I. - Mišík, L. - Švec, M.: Matematika I, ALFA, Bratislava, 1971. 4. Demidovič, B. P.: Sbírka úloh a cvičení z matematické analýzy, Fragment, Praha, 2003. 5. Brannan, D.: A First Course in Mathematical Analysis, Cambridge University Press, Cambridge 2006. 6. Bruckner, A. M., Bruckner J. B., Thomson, B. S.: Real Analysis, Second Edition, ClassicalRealAnalysis.com, 2008. 7. Zorich, V. A.: Mathematical Analysis I, Springer-Verlag 2002.	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 346					
A	B	C	D	E	FX
11.27	12.72	16.47	21.68	31.5	6.36
<b>Provides:</b> prof. RNDr. Ondrej Hutník, PhD., RNDr. Lenka Halčinová, PhD.					
<b>Date of last modification:</b> 17.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ MMD/22		<b>Course name:</b> Mathematical modeling			
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 <b>Per study period:</b> 42 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 3					
<b>Recommended semester/trimester of the course:</b> 1.					
<b>Course level:</b> I.					
<b>Prerequisites:</b>					
<b>Conditions for course completion:</b> Submitting a project from the specified list of projects and, possibly, a related short presentation.					
<b>Learning outcomes:</b> Using concrete examples of problems from real life, students will become familiar with several approaches and strategies for creating a mathematical model of specified problem as well as with defining the conditions related a real problem and transforming them into created mathematical model.					
<b>Brief outline of the course:</b> One specified real-life problem will be discussed, explored and modeled each week.					
<b>Recommended literature:</b> 1. E. Lindner, A. Micheletti, C. Nunes (eds.), Mathematical Modelling in Real Life Problems, Springer, 2020. 2. K.K. Tung, Topics in Mathematical Modeling, Princeton University Press, 2007. 3. H. P. Williams, Model Building in Mathematical Programming, Wiley, 2013.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 62					
A	B	C	D	E	FX
77.42	12.9	4.84	0.0	0.0	4.84
<b>Provides:</b> doc. RNDr. Martina Hančová, PhD., RNDr. Jana Borzová, PhD., RNDr. Igor Fabrici, Dr. rer. nat., RNDr. Lenka Halčinová, PhD., doc. Mgr. Jozef Kiseľák, PhD., doc. RNDr. Daniel Klein, PhD., RNDr. Lucia Kószegyová, PhD., RNDr. Jaroslav Šupina, PhD., Mgr. Martin Vodička, Dr. rer. nat., prof. RNDr. Ivan Žežula, CSc.					
<b>Date of last modification:</b> 25.08.2022					

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ BSM/25		<b>Course name:</b> Mathematical models			
<b>Course type, scope and the method:</b> <b>Course type:</b> <b>Recommended course-load (hours):</b> <b>Per week: Per study period:</b> <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 4					
<b>Recommended semester/trimester of the course:</b>					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/ALG1d/10 and ÚMV/DSMc/10 and ÚMV/LCO/10 and ÚMV/MAN1d/22					
<b>Conditions for course completion:</b> Broader knowledge of profile subjects of the study program. Ability to define concepts from a given field, formulate properties and statements related to them, know the connections between them and illustrate or apply them to selected problems.					
<b>Learning outcomes:</b> Acquired knowledge in basic mathematical disciplines, overview of used models, objects and properties, understanding of important statements and methods, recognition of possible applications and ability to formulate, model and solve problems from these areas.					
<b>Brief outline of the course:</b> The state examination is performed in a form of a debate with the emphasis on one topic of the following courses: ALG, DSM, LCO, MAN.					
<b>Recommended literature:</b>					
<b>Course language:</b> slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 0					
A	B	C	D	E	FX
0.0	0.0	0.0	0.0	0.0	0.0
<b>Provides:</b>					
<b>Date of last modification:</b> 26.03.2026					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ MSW/10	<b>Course name:</b> Mathematical software
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 1 / 2 <b>Per study period:</b> 14 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 3	
<b>Recommended semester/trimester of the course:</b> 2.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Master the basics of working with a spreadsheet calculator, working in the R programming language and the Maple computer algebra system. Demonstrate the ability to use these tools to solve problems in different areas of mathematics. Points are given for two semester tests and homework assignments: A test on solving problems in a spreadsheet environment (20 points) and a test on solving problems using R and Maple (20 points), homework assignments focusing on solving exercises using R and Maple (10 points). The grade is awarded according to the number of points obtained: A - 45 or more, B - 40 to 44, C - 35 to 39, D - 30 to 34, E - 25 to 29, Fx - less than 25.	
<b>Learning outcomes:</b> Knowledge and skills of using different representations of data and modeling in solving different types of mathematical problems in the environment of a spreadsheet, R language and the system of symbolic calculations Maple. Be able to analyze data when working with tables, create different types of graphs, use different types of functions implemented in a spreadsheet and mathematical methods to solve problems.	
<b>Brief outline of the course:</b> 1. Creation and use of formulas, creation and modification of graphs. 2. Use of different types of functions implemented in a spreadsheet, problems from financial mathematics. 3. Statistical data processing, creation of stochastic models, Monte Carlo method. 4. Implementation of algorithms in tables, graphical and numerical solution of equations and systems of linear equations. 5, Linear optimization, test Basic description of Maple system and R language, work with matrices and vectors, work with data and data files. Basic programming techniques, creating your own functions and scripts, graphical capabilities of the system for data visualization. Modification of mathematical expressions, solution of equations and inequalities, mathematical analysis, linear algebra, theory of numbers, graphs and sets in the Maple system.	
<b>Recommended literature:</b>	

1. Shingareva, Lizárraga-Celaya: Maple and Mathematica. A problem solving approach for mathematics, Springer Wien NewYork, 2007
2. Eberhart: Maple problem solving handbook, University of Kentucky, 2009
3. Šťastný: Matematické a statistické výpočty v Microsoft Excelu, Computer Press 2001

**Course language:**

Slovak

**Notes:**

**Course assessment**

Total number of assessed students: 244

A	B	C	D	E	FX
23.36	20.49	21.72	20.08	11.07	3.28

**Provides:** RNDr. Alfréd Onderko, PhD., Mgr. Matej Uhrin

**Date of last modification:** 06.02.2025

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ MST/19	<b>Course name:</b> Mathematical statistics
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/TPP/19	
<b>Conditions for course completion:</b> Total evaluation based on two written tests during the semester (2x40p) and the result of the written (30p) and oral part of the exam (30p). At least 50% must be obtained from each part. Final evaluation: $\geq 90\%$ A; $\geq 80\%$ B; $\geq 70\%$ C; $\geq 60\%$ D; $\geq 50\%$ E; $< 50\%$ FX.	
<b>Learning outcomes:</b> Student should obtain the knowledge about basic statistical methods and the ability to apply theoretical knowledge in practical problems solving.	
<b>Brief outline of the course:</b> <ol style="list-style-type: none"> <li>1. Random vectors (definition, distributions, characteristics, joint and marginal distributions).</li> <li>2. Covariance, correlation and regression.</li> <li>3. Random sample, sampling distributions and characteristics.</li> <li>4. Some important statistics and their distributions.</li> <li>5. Point estimators and their properties.</li> <li>6. Maximum likelihood method.</li> <li>7. Interval estimates, confidence interval construction (2 weeks).</li> <li>8. Testing of statistical hypothesis (critical region, level of significance and power of test, methods for searching optimal critical regions).</li> <li>9. Some important parametric tests (2 weeks).</li> <li>10. Some important nonparametric tests (2 weeks).</li> </ol>	
<b>Recommended literature:</b> <ol style="list-style-type: none"> <li>1. Skřivánková V.: Pravdepodobnosť v príkladoch, UPJŠ, Košice, 2006 (in Slovak)</li> <li>2. Skřivánková V.-Hančová M.: Štatistika v príkladoch, UPJŠ, Košice, 2005 (in Slovak)</li> <li>3. Casella, G., Berger, R., Statistical Inference, 2nd ed., Chapman and Hall/CRC, 2024</li> <li>4. DeGroot, M. H., Schervish, M. J.: Probability and Statistics, 4th ed., Pearson, Boston, 2012</li> <li>5. Anděl J.: Základy matematické statistiky, MatfyzPress, Praha, 2011 (in Czech)</li> </ol>	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 206					
A	B	C	D	E	FX
26.7	20.87	16.5	17.96	10.68	7.28
<b>Provides:</b> doc. RNDr. Martina Hančová, PhD.					
<b>Date of last modification:</b> 21.11.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ MAP/19	<b>Course name:</b> Matrix calculus
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/ALG1b/24 or ÚMV/ALG3b/22	
<b>Conditions for course completion:</b> Exam	
<b>Learning outcomes:</b> Mastering basic knowledge on matrices, their properties, different matrix decompositions, and special matrices.	
<b>Brief outline of the course:</b> 1. Basic concepts of linear algebra, geometry of vector spaces 2. Basic concepts of matrix algebra, special matrices, matrix operations, vectorization of matrices 3. Column space and null space of a matrix, rank of a matrix 4. Inverse matrices, orthogonal and permutation matrices 5. Matrix space and its geometry 6. Generalized inverse matrices 7. Idempotent matrices and projection matrices 8. Determinant of a matrix 9. Positive semidefinite and positive definite matrices 10. Eigenvalues and eigenvectors of matrices 11. Singular decomposition and matrix norms	
<b>Recommended literature:</b> 1. Rosa, S., Harman, R.: Maticová algebra pre štatistiku a analýzu dát, FMFI UK, 2021. 2. Strang, G.: Linear Algebra and Learning from Data, Wellesley- Cambridge Press, 2019. 3. Seber, G.A.F.: A matrix handbook for statisticians. John Wiley & Sons, 2008 4. Searle, S.R., Khuri, A.I.: Matrix algebra useful for statistics. John Wiley & Sons, 2017. 5. Meyer, C.D.: Matrix Analysis and applied linear algebra. SIAM, 2000	
<b>Course language:</b> Slovak and English	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 43					
A	B	C	D	E	FX
27.91	18.6	18.6	16.28	13.95	4.65
<b>Provides:</b> prof. RNDr. Ivan Žežula, CSc., doc. RNDr. Daniel Klein, PhD.					
<b>Date of last modification:</b> 14.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ MIE/13		<b>Course name:</b> Microeconomics			
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 1 <b>Per study period:</b> 28 / 14 <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 4					
<b>Recommended semester/trimester of the course:</b> 3., 5.					
<b>Course level:</b> I.					
<b>Prerequisites:</b>					
<b>Conditions for course completion:</b> Continuous assessment: feedback in MOODLE, small tests during tutorial (notions), two written exams (solving problems). Final oral exam: ability of verbal argumentation and graphical explanation of studied models.					
<b>Learning outcomes:</b> Understanding of basic principles of microeconomics and ability to apply them in practical situations.					
<b>Brief outline of the course:</b> Economics and economy. Supply and demand. Consumer Theory. Theory of firm. Perfect competition. Monopoly. Labour market. Market failure. Externalities and Public goods.					
<b>Recommended literature:</b> 1. lms.upjs.sk: lectures, tutorials and other material 2. H.L. Varian, Intermediate Mikroekonomics, WW Norton, 1993 3. J.M. Perloff, Microeconomics, 6th Edtion, Addison Wesley, 2012 4. J. Sloman, Economics, 6th Edition, Prentice Hall, 2006					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 97					
A	B	C	D	E	FX
26.8	21.65	18.56	18.56	12.37	2.06
<b>Provides:</b> prof. RNDr. Katarína Cechlárová, DrSc.					
<b>Date of last modification:</b> 24.11.2024					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ NUM/19	<b>Course name:</b> Numerical methods
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 3 <b>Per study period:</b> 28 / 42 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 6	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> (ÚMV/MANb/19 or ÚMV/MAN2b/22 or ÚMV/FRPb/19) and (ÚMV/ALG1b/24 or ÚMV/ALG2b/22 or ÚMV/ALG3b/22 or ÚMV/ALG4b/22)	
<b>Conditions for course completion:</b> Form: Lectures and practices using computers. Solving problems and programming algorithms using the computational platform SageMath (including Python, NumPy, SciPy, SymPy, R, Maxima, matplotlib, GAP, FLINT, and many other packages). Interim assessment (50% of the total assessment): Solving assigned tasks e.g. in the form of implementation of algorithms or their parts, modification of existing codes or use of available packages in solving real problems. Final examination (50% of the total assessment): It consists of verifying the understanding of the theory taken over and demonstrating the practical skills acquired.	
<b>Learning outcomes:</b> After completing the course, the student will acquire theoretical knowledge and practical skills regarding the principles and implementation of basic numerical algorithms with emphasis on algorithms used in the field of data analysis. The student should be able to understand and implement numerical algorithms in programming language independently, to be able to modify components of existing algorithms and also be able to solve (real) problems by selecting an appropriate numerical method with the available effective computational packages.	
<b>Brief outline of the course:</b> 1. Basic principles and techniques of numerical analysis - computer implementation and representation of real numbers, numerical vs. symbolic (analytical) calculations, method vs. algorithm, error measurement of numerical solution, conditionality of numerical problems, stability and convergence of numerical algorithms. 2. Solution of nonlinear equations - methods of bisection and simple iteration, the false position method and Newton method, Newton-Raphson method. 3. Numerical differentiation and integration - trapezoidal method, Simpson method, Newton-Cotes formulas. 4. Approximation of functions and smoothing of data, using polynomials, interpolation, splines, kernel methods.	

5. Linear systems - Gaussian elimination with and without pivoting, forward and backward substitution, scaled partial pivoting, singularity and perturbation, matrix conditionality, Thomas method, iterative methods - Jacobi, Gauss-Seidel, SOR method, gradient methods - gradient descent, conjugate directions.
6. Eigenvalues and eigenvectors of matrices - estimation of eigenvalues, partial eigenvalue problem (power method and Rayleigh method, Hessenberg shape), complete eigenvalue problem (calculation of dominant eigenvalue, LU, QU, QR - decomposition, Jacobi method), SVD - Singular Matrix Decomposition.
7. Optimization - MLS, Cauchy method of the highest gradient, Newton method, conjugated gradient method of Fletcher-Reeves, Quasi-Newton methods, Regularization of ill-conditioned problems.

**Recommended literature:**

1. Ackleh, A. S., Allen, E. J., Kearfott, R. B., & Seshaiyer, P. (2009). Classical and Modern Numerical Analysis: Theory, Methods and Practice (1 edition). Boca Raton: Chapman and Hall/ CRC.
2. Anastassiou, G. A., & Mezei, R. (2015). Numerical Analysis Using Sage. Springer International Publishing.
3. Cheney, E. W., & Kincaid, D. R. (2012). Numerical Mathematics and Computing (7 edition). Boston, MA: Cengage Learning.
4. O'Leary, D. P. (2008). Scientific Computing with Case Studies. Philadelphia: Society for Industrial and Applied Mathematics.
5. Sauer, T. (2017). Numerical Analysis. (3 edition). Hoboken, NJ? Pearson.
6. Segethová, J. (2002). Základy numerické matematiky. Karolinum.
7. M. Vicher (2003). Numerická matematika.

**Course language:**

Slovak

**Notes:**

**Course assessment**

Total number of assessed students: 158

A	B	C	D	E	FX
17.09	17.72	9.49	13.29	31.65	10.76

**Provides:** RNDr. Andrej Gajdoš, PhD., doc. Mgr. Jozef Kiseľák, PhD.

**Date of last modification:** 18.04.2022

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ ZUC/10	<b>Course name:</b> Principles of book-keeping
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Three tests: single-entry accountig (complex example), double-entry accounting (complex example), conceptual apparatus of accounting. The final evaluation is given at the basis of partial tests.	
<b>Learning outcomes:</b> To learn basics of economic conceptual and procedural apparatus of accounting.	
<b>Brief outline of the course:</b> The history and legal regulations of accounting. Structure of accounting in a bussines company, bank and insurance company; accounting information system. Various kinds of business, trade licence and trade law. Company subjects, banks and insurance companies - the financial instruments. Single-entry accountig system, statements. Assets and its sources. Assets and liability pricing. Balance principle. Assets and liabilities list. Balance sheet, structure of assets and liabilities. Double-entry accounting records. Account, accounting on accounts of balance sheet and income statement. Synthetic and analytical records. Account classification of business companies, banks and insurance companies, the principles of its construction. Balance sheet, income statement. Financial statement (simple and consolidated).	
<b>Recommended literature:</b> Soukupová B., Šlosárová A., Baštincová A.: Účtovníctvo. Bratislava: Iura Edition, 2001 Máziková a kol.: Účtovníctvo (učebné texty). Bratislava: Iura Edition, 2009 Beňová E. a kol.: Financie a mena. Bratislava: Iura Edition, 2005 The Law of NR SR no. 43/2002 Z. z. on accounting, the law on income tax no. 595/2003 Z. z.	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 100					
A	B	C	D	E	FX
18.0	23.0	29.0	15.0	14.0	1.0
<b>Provides:</b> doc. RNDr. Daniel Klein, PhD.					
<b>Date of last modification:</b> 04.03.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ TPP/19	<b>Course name:</b> Probability theory
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 2 <b>Per study period:</b> 28 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 5	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/MAN1c/22 or ÚMV/MAN2c/22 or ÚMV/FRPa/19	
<b>Conditions for course completion:</b> To obtain at least 50% in two written tests during the semester. Total evaluation based on written tests and oral exam.	
<b>Learning outcomes:</b> To obtain knowledge of the axiomatic theory of probability, random variables and their characteristics, special types of distributions and their applications.	
<b>Brief outline of the course:</b> Probability space, definitions and properties of probability. Conditional probability and independence. Random variables, their distribution function and characteristics. Mean, variance and skewness. Discrete and absolutely continuous distributions. Quantile and characteristic functions, their properties. Relation between characteristic function and moments. Median and mode. Transformation of random variables. Special types of distributions with applications (binomial, Poisson, geometric, uniform, exponential, normal, chi-square, Student, Fisher). Central limit theorem.	
<b>Recommended literature:</b> 1. Skřivánková V.: Pravdepodobnosť v príkladoch, UPJŠ, Košice, 2006 (in Slovak) 2. DeGroot, M. H., Schervish, M. J.: Probability and Statistics, 4th ed., Pearson, Boston, 2012 3. Evans, M. J., Rosenthal, J. S.: Probability and Statistics: The Science of Uncertainty, 2nd Ed., W. H. Freeman, 2009 4. Riečan et al.: Pravdepodobnosť a matematická štatistika, Alfa, Bratislava, 1984 (in Slovak) 5. Potocký a kol.: Zbierka úloh z pravdepodobnosti a matematickej štatistiky, Alfa, Bratislava, 1991	
<b>Course language:</b> Slovak	
<b>Notes:</b>	

<b>Course assessment</b>					
Total number of assessed students: 383					
A	B	C	D	E	FX
15.4	13.58	17.23	21.93	25.07	6.79
<b>Provides:</b> RNDr. Andrej Gajdoš, PhD.					
<b>Date of last modification:</b> 27.01.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ PJP/25	<b>Course name:</b> Programming language Python
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 1 / 2 <b>Per study period:</b> 14 / 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 4	
<b>Recommended semester/trimester of the course:</b> 4., 6.	
<b>Course level:</b> I., N	
<b>Prerequisites:</b> ÚINF/PAZ1a/15	
<b>Conditions for course completion:</b> At least 50 % of the marks in the continuous assessment A minimum of 50 % marks in the mid-term test and the final exam practical test	
<b>Learning outcomes:</b> Implement solutions to selected problems in Python using available modules. Use and implement non-trivial algorithms to solve selected problems. Use an object-oriented approach to problem solving. Program in Python in an object-oriented manner using Python specifics. Test programs. Implement parallel computing.	
<b>Brief outline of the course:</b> 1. Introduction to the environment, basic features of Python, simple and structured data types. 2. Input, output, function definition, lambda function, generator notation, function as parameter, string formatting. 3. Control structures, iterating over data structures, context manager. 4. Exception handling and exception raising. Philosophy of exceptions in Python. 5. Working with files. Serialization and deserialization of data - json and pickle protocol. Text and binary files. Manipulation with files. Open data. 6. Object-oriented programming 1. Design of custom classes, special methods, properties, philosophy of accessing methods and attributes. 7. Object-oriented programming 2. Comparison and differences with Java. Multiple inheritance. 8. Method overloading. Static methods, abstract classes, data class. 9. Decorators, memoization, modules, packages. 10. Code validation (debugging), testing (doctest, unittest), test-driven development. 11. Parallel computing, processes, process triggering and inter-process communication (shared variable, pipe, queue). 12. Graphical program design and implementation.	
<b>Recommended literature:</b> PILGRIM, Mark, 2011. Ponořme se do Pythonu(u) 3 [online]. Praha: CZ.NIC, z. s. p. o. ISBN 978-80-904248-2-1. Available at: <a href="https://www.nic.cz/files/edice/python_3.pdf">https://www.nic.cz/files/edice/python_3.pdf</a>	

<p>PIRNAT, Mike, 2015. How to Make Mistakes in Python [online]. Boston: O'Reilly Media. ISBN 978-1-4919-3447-0. Available at: <a href="https://www.dbooks.org/how-to-make-mistakes-in-python-1491934476/">https://www.dbooks.org/how-to-make-mistakes-in-python-1491934476/</a></p> <p>STACK OVERFLOW CONTRIBUTORS, 2018. Python® Notes for Professionals [online]. B.m.: GoalKicker. Available at: <a href="https://books.goalkicker.com/PythonBook/PythonNotesForProfessionals.pdf">https://books.goalkicker.com/PythonBook/PythonNotesForProfessionals.pdf</a></p> <p>ROSEMAN, Mark, 2024. Modern Tk Best Practices [online]. 2024. Available at: <a href="https://tkdocs.com/">https://tkdocs.com/</a></p>					
<p><b>Course language:</b> Slovak language, knowledge of English language is only required to read documentation of Python.</p>					
<p><b>Notes:</b></p>					
<p><b>Course assessment</b> Total number of assessed students: 41</p>					
A	B	C	D	E	FX
4.88	12.2	41.46	24.39	7.32	9.76
<p><b>Provides:</b> PaedDr. Ján Guniš, PhD., univerzitný docent, RNDr. Zoltán Szoplák, doc. RNDr. Ľubomír Šnajder, PhD., Ing. Peter Lokša, PhD., Mgr. Samuel Baran, Mgr. Norbert Michel'</p>					
<p><b>Date of last modification:</b> 08.03.2025</p>					
<p><b>Approved:</b> doc. RNDr. Roman Soták, PhD.</p>					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ PAZ1a/15	<b>Course name:</b> Programming, algorithms, and complexity
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 3 / 4 <b>Per study period:</b> 42 / 56 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 8	
<b>Recommended semester/trimester of the course:</b> 3.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Graded activities during semester: assignments, small exams, midterm, final project. Final examination: practical finalterm focused on a complex task. Rules to pass the subject: Pass the minimal limit of points for category of homeworks (assignments, final project) and tests (small exams, midterm). Get at least 42% from the finalterm and pass the defined limit of total points for all graded activities.	
<b>Learning outcomes:</b> Get an ability to implement basic Java programs and obtain essential knowledge related to object-oriented programming.	
<b>Brief outline of the course:</b> 1. Introduction to Java and JPAZ2 framework, first Eclipse project, interactive communication with objects using turtle graphics, repeating code in loops, notion of class, object, and method. 2. For-loops, local variables, variable types, arithmetic expressions, random numbers, random walk, conditions. 3. While-loop, returning a value from a method, reference and reference variables, debugging. 4. Primitive and reference types, chars, String objects (including basic algorithms), mouse events, instance variables. 5. Array of primitive values and array of references, simple array algorithms. 6. Advanced array algorithms, two-dimensional array. 7. Exceptions and exception handling, files and directories, writing to text files. 8. Reading from text files. 9. Creating classes, encapsulation, getters and setters, constructors and their hierarchy, method overloading. 10. Inheritance and polymorphism. 11. Java Collections Framework, ArrayList class, wrapper classes for primitive types and autoboxing, interfaces List, Set, Map and their implementations, methods equals and hashCode. 12. Access modifiers, abstract classes and methods, creating and implementing interfaces, sorting, static methods and variables. 13. Creating and throwing exceptions, checked and runtime exceptions, JavaDoc, Maven.	
<b>Recommended literature:</b>	

1. ECKEL, Bruce. Thinking in Java. Fourth edition. Upper Saddle River, NJ: Prentice Hall, c[2006]. ISBN 978-01-318-7248-6.
2. PECINOVSKÝ, Rudolf. OOP: naučte se myslet a programovat objektově. Brno: Computer Press, 2010. ISBN 978-80-251-2126-9.
3. SIERRA, Kathy a Bert BATES. Head first Java. Vyd. 2. Sebastopol: O'Reilly, 2005. ISBN 978-05-960-0920-5.

**Course language:**

Slovak language, english language is required only to read Java API documentation.

**Notes:**

**Course assessment**

Total number of assessed students: 1040

A	B	C	D	E	FX
17.31	8.56	13.27	19.23	14.13	27.5

**Provides:** RNDr. Juraj Šebej, PhD., univerzitný docent, RNDr. Miroslav Opiela, PhD., RNDr. Viktor Pristaš, PhD., RNDr. Dominika Kotlářová, doc. RNDr. Ľubomír Šnajder, PhD., Mgr. Martin Bača, Mgr. Šimon Huraj

**Date of last modification:** 04.01.2022

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ PAZ1b/15	<b>Course name:</b> Programming, algorithms, and complexity
<b>Course type, scope and the method:</b> <b>Course type:</b> Lecture / Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 / 4 <b>Per study period:</b> 28 / 56 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 7	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚINF/PAZ1a/15	
<b>Conditions for course completion:</b> Graded activities during semester: assignments, small theoretical exams, practical and theoretical midterm. Final examination: practical and theoretical finalterm. Rules to pass the subject: Get at least 50% from theoretical activities (small exams, theoretical midterm and theoretical finalterm) and from practical activities (practical midterm and finalterm). Pass the defined limit of total points for all graded activities.	
<b>Learning outcomes:</b> To know essential algorithms, data structures, and methods used for efficient algorithms design. To understand time complexity analysis. To practice efficient implementation of algorithms. To recognize combinatorial and graph algorithms.	
<b>Brief outline of the course:</b> 1. Recursion and fractals. 2. Binary search, basic sorting algorithms, time complexity analysis, O-notation. 3. Basic data structures and algorithms: linked list, stack, queue. 4. Trees and their applications. 5. Efficient sorting algorithms (QuickSort, MergeSort, HeapSort). 6. Backtracking. 7. Dynamic programming, divide and conquer strategy. 8. Unweighted graphs, graph traversal, graph topological sort. 9. Weighted graphs, the shortest path algorithms. 10. Minimum spanning tree, greedy algorithms. 11. Hashing, amortized time complexity, string-searching algorithms.	
<b>Recommended literature:</b> 1. WRÓBLEWSKI, Piotr. Algoritmy: datové struktury a programovací techniky. Brno: Computer Press, 2004. ISBN 80-251-0343-9. 2. CORMEN, Thomas H. Introduction to algorithms. 3rd ed. Cambridge: MIT Press, c2009. ISBN 978-0-262-03384-8. 3. KLEINBERG, Jon a Éva TARDOS. Algorithm design. Thirteenth impression. Noida, India: Pearson, c2014. ISBN 9789332518643.	

4. MAREŠ, Martin a Tomáš VALLA. Průvodce labyrintem algoritmů. Praha: CZ.NIC, z.s.p.o., 2017. CZ.NIC. ISBN 978-80-88168-19-5.					
<b>Course language:</b> Slovak language, literature is available in english and czech language.					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 1429					
A	B	C	D	E	FX
15.54	8.05	10.78	18.75	20.43	26.45
<b>Provides:</b> RNDr. Juraj Šebej, PhD., univerzitný docent, RNDr. Miroslav Opiela, PhD., RNDr. Viktor Pristaš, PhD., RNDr. Dominika Kotlárová, doc. RNDr. Ľubomír Šnajder, PhD., Mgr. Martin Bača, Mgr. Šimon Huraj					
<b>Date of last modification:</b> 04.01.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ SMA/10		<b>Course name:</b> Seminar in macroeconomics			
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 2					
<b>Recommended semester/trimester of the course:</b> 4., 6.					
<b>Course level:</b> I.					
<b>Prerequisites:</b> ÚMV/MAE/10					
<b>Conditions for course completion:</b> Active work during semester, acceptable results of projects and their presentation in the class.					
<b>Learning outcomes:</b> Extend the knowledge acquired in Macroeconomics.					
<b>Brief outline of the course:</b> The work in seminar consists of study of extended topics in Macroeconomics, projects aimed at collecting and interpreting data, work with recent journal and newspapers publications.					
<b>Recommended literature:</b> Olivier Blanchard, Alessia Amighini, Francesco Giavazzi, Macroeconomics, a European perspective, Pearson Education, 2010 N. Gregory Mankiw, Macroeconomics, 7th Edition, Harvard University, Worth Publishers 2009 Newspapers and journals, in particular The Economist, Hospodárske noviny, SME.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 66					
A	B	C	D	E	FX
37.88	36.36	13.64	4.55	6.06	1.52
<b>Provides:</b> prof. RNDr. Katarína Cechlárová, DrSc.					
<b>Date of last modification:</b> 18.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ SMI/10	<b>Course name:</b> Seminar in microeconomics
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 4., 6.	
<b>Course level:</b> I.	
<b>Prerequisites:</b> ÚMV/MIE/13	
<b>Conditions for course completion:</b> Active work during semester, acceptable results of projects and their presentation in the class.	
<b>Learning outcomes:</b> Students will extend and deepen their knowledge and skills obtained in the course of Microeconomics. They will be able to look up every-day information and interpret it with the help of microeconomic theory. They will learn how to study scientific economic publications.	
<b>Brief outline of the course:</b> The work in seminar consists of study of extended topics in Microeconomics, projects aimed at collecting and interpreting data, work with recent journal and newspapers publications. Possible topics. 1. Approximate computations, for example: losses from decrease of VAT, cost of doubling family subsidies, etc. 2. Externalities and public goods.. 3. Duopoly and oligopoly. 4. Taxes in detail. 5. Minimum wages pros and cons. 6. Sharing economy. 7. How to read a scientific paper. 8. Optimal consumer choice. 9. Consumer price index. 10. Price elasticity - how to compute it? 11. Nobel prizes	
<b>Recommended literature:</b> 1. Newspapers and journals 2. H.L. Varian, Mikroekonomie, Victoria Publishing, Praha, 1995/ Varian: Intermediate Microeconomics, W.W. Norton, 1993 3. J.M. Perloff, Microeconomics, 6th Edition, Addison Wesley, 2012 4. J. Sloman, Economics, 6th Edition, Prentice Hall, 2006 5. webpages, like <a href="https://mru.org/courses/principles-economics-microeconomics">https://mru.org/courses/principles-economics-microeconomics</a> , <a href="https://www.khanacademy.org">https://www.khanacademy.org</a>	

<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 58					
A	B	C	D	E	FX
55.17	10.34	15.52	12.07	6.9	0.0
<b>Provides:</b> prof. RNDr. Katarína Cechlárová, DrSc.					
<b>Date of last modification:</b> 18.04.2022					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ SHMa/22	<b>Course name:</b> Seminar on history of mathematics I
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 <b>Per study period:</b> 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 4., 6.	
<b>Course level:</b> I., II.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Conditions for continuous evaluation: <ol style="list-style-type: none"> <li>1. Participation in teaching in accordance with the study rules and instructions of the teacher.</li> <li>2. Activity.</li> <li>3. Homework and tests.</li> <li>4. Seminar work and its presentation at the seminar – poster from history of mathematics on the selected topic</li> </ol> Conditions for successful completion of the course: <ol style="list-style-type: none"> <li>1. Participation in teaching in accordance with the study regulations and according to the instructions of the teacher;</li> <li>2. Credits will be awarded to students who score at least 50% on homework assignments and tests. Additional points can be achieved for the presentation of a seminar paper.</li> </ol>	
<b>Learning outcomes:</b> The student knows the main stages of the development of mathematics, the history of the development of the language of mathematics, the development of selected concepts and some mathematical disciplines. The student understands the parallels between the phylogeny and ontogeny of mathematical thinking.	
<b>Brief outline of the course:</b> Prehistory, ontogeny and phylogeny. Mathematics in ancient cultures: Egypt, Mesopotamia, China, India. Mathematics in ancient Greece: Origins of Greek natural philosophy and mathematics. The discovery of incommensurability and its consequences (Pythagoras and his school). Classical problems of Greek mathematics. Problems with infinity (Zeno). Eudoxus' method. Plato, Aristotle, Euclid and his Foundations. Archimedes of Syracuse, Eratosthenes, Apollónios, Claudios Ptolemy, Diophantos. Arabic mathematics and its relation to medieval European mathematics. The origins of modern mathematics. The search for the roots of polynomial equations. The origins of analytic geometry. Probability. Infinitesimal calculus. Number theory. Non-Euclidean geometry. The origin of set theory. Development of mathematical symbolism.	

Selected topics in school mathematics from the perspective of the history of mathematics.

**Recommended literature:**

Burton, D. M.: The History of Mathematics: An Introduction. McGraw–Hill, 2007.

Devlin, K.: Jazyk matematiky. Dokořán, 2002. (in czech)

Čižmár, J . Dejiny matematiky (Od najstarších čias po takmer súčasnosť) Perfekt, 2017. (in slovak)

Mareš , M . Příběhy matematiky. Pistorius, 2011. (in czech)

**Course language:**

Slovak

**Notes:**

**Course assessment**

Total number of assessed students: 194

A	B	C	D	E	FX
69.07	15.98	7.22	3.61	2.06	2.06

**Provides:** doc. RNDr. Ingrid Semanišínová, PhD.

**Date of last modification:** 24.08.2022

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚMV/ SHMb/22	<b>Course name:</b> Seminar on history of mathematics II
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 5.	
<b>Course level:</b> I., II.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Conditions for continuous evaluation: <ol style="list-style-type: none"> <li>1. Participation in teaching in accordance with the study rules and instructions of the teacher.</li> <li>2. Activity.</li> <li>3. Homeworks.</li> <li>4. Seminar work on the selected topic and its presentation at the seminar</li> </ol> Conditions for successful completion of the course: <ol style="list-style-type: none"> <li>1. Participation in teaching in accordance with the study regulations and according to the instructions of the teacher;</li> <li>2. Credits will be awarded to students who score at least 50% on homework assignments and tests. Additional points can be achieved for the presentation of a seminar paper.</li> </ol>	
<b>Learning outcomes:</b> Students will demonstrate an understanding of the history of the development of some mathematical disciplines and selected concepts. They will demonstrate this understanding by scoring at least 50% on previous topics and homework assignments.	
<b>Brief outline of the course:</b> <ol style="list-style-type: none"> <li>1. Algebra and geometry of 16th and 17th century - Tartaglia, Vieta, Descartes</li> <li>2. Beginning of modern number theory - Mersenne, Fermat</li> <li>3. Development of infinitesimals -- Newton, Leibniz, Bernoulli</li> <li>4. Complex and hypercomplex numbers -- Hamilton, Cayley, Clifford</li> <li>5. Combinatory and probability - Pascal, Fermat</li> <li>6. Algebra in the 18th and 19th century - Gauss, Abel, Galois</li> <li>7. Non-Euclidean geometries - Gauss, Lobačevskij, Bolyai</li> <li>8. Mathematical analysis in the 19th century - Cauchy, Bolzano, Weierstrass</li> <li>9. Set theory - Bolzano, Cantor, Zermelo, Franklin</li> <li>10. Mathematics in the beginning of 20th century - Peano, Hilbert, Gödel</li> </ol>	
<b>Recommended literature:</b> Berlinghoff, W.P., Gouvea, F.Q.: Math through the Ages, MAA Press, 2015. Čižmár, J. Dejiny matematiky (Od najstarších čias po takmer súčasnosť) Perfekt, 2017. Hairer, E., Wanner, G.: Analysis by its History, Springer, 2008.	

Mareš , M . Příběhy matematiky. Pistorius, 2011.					
<b>Course language:</b> Slovak					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 46					
A	B	C	D	E	FX
60.87	23.91	13.04	2.17	0.0	0.0
<b>Provides:</b> prof. RNDr. Ondrej Hutník, PhD.					
<b>Date of last modification:</b> 21.09.2023					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚTVŠ/ TVa/11	<b>Course name:</b> Sports Activities I.
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> combined, present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I., II., P	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Min. 80% of active participation in classes.	
<b>Learning outcomes:</b> Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
<b>Brief outline of the course:</b> Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
<b>Recommended literature:</b> BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: <a href="https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571">https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571</a> BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.  
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**  
Slovak language

**Notes:**

**Course assessment**

Total number of assessed students: 16384

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
85.48	0.06	0.0	0.0	0.0	0.04	9.25	5.17

**Provides:** Mgr. Patrik Berta, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Melicharová, PhD., Mgr. Marcel Čurgali, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD., Mgr. Július Evelley, PhD.

**Date of last modification:** 07.02.2024

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚTVŠ/ TVb/11	<b>Course name:</b> Sports Activities II.
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> combined, present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 2.	
<b>Course level:</b> I., II., P	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> active participation in classes - min. 80%.	
<b>Learning outcomes:</b> Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
<b>Brief outline of the course:</b> Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
<b>Recommended literature:</b> BENČE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: <a href="https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571">https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571</a> BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. ŠNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.  
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**  
Slovak language

**Notes:**

**Course assessment**

Total number of assessed students: 14337

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
83.67	0.47	0.01	0.0	0.0	0.04	11.47	4.32

**Provides:** Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Marcel Čurgali, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Melicharová, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD., Mgr. Július Evelley, PhD.

**Date of last modification:** 07.02.2024

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚTVŠ/ TVc/11	<b>Course name:</b> Sports Activities III.
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 3.	
<b>Course level:</b> I., II.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> min. 80% of active participation in classes	
<b>Learning outcomes:</b> Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
<b>Brief outline of the course:</b> Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
<b>Recommended literature:</b> BENČE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: <a href="https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571">https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571</a> BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. ŠNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.  
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**  
Slovak language

**Notes:**

**Course assessment**

Total number of assessed students: 9620

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
87.8	0.06	0.01	0.0	0.0	0.02	5.16	6.95

**Provides:** Mgr. Marcel Čurgali, PhD., Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Melicharová, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD., Mgr. Július Evelley, PhD.

**Date of last modification:** 07.02.2024

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚTVŠ/ TVd/11	<b>Course name:</b> Sports Activities IV.
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I., II.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> min. 80% of active participation in classes	
<b>Learning outcomes:</b> Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
<b>Brief outline of the course:</b> Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
<b>Recommended literature:</b> BENČE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: <a href="https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571">https://www.ff.umb.sk/app/cmsFile.php?disposition=a&amp;ID=571</a> BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. ŠNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.  
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**  
Slovak language

**Notes:**

**Course assessment**

Total number of assessed students: 6052

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
82.19	0.26	0.03	0.0	0.0	0.0	8.67	8.84

**Provides:** Mgr. Marcel Čurgali, PhD., Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Melicharová, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD., Mgr. Július Evelley, PhD.

**Date of last modification:** 07.02.2024

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice					
<b>Faculty:</b> Faculty of Science					
<b>Course ID:</b> ÚMV/ SVK/10		<b>Course name:</b> Students scientific conference			
<b>Course type, scope and the method:</b> <b>Course type:</b> <b>Recommended course-load (hours):</b> <b>Per week: Per study period:</b> <b>Course method:</b> present					
<b>Number of ECTS credits:</b> 4					
<b>Recommended semester/trimester of the course:</b>					
<b>Course level:</b> I., II.					
<b>Prerequisites:</b>					
<b>Conditions for course completion:</b>					
<b>Learning outcomes:</b> Individual scientific work of students. Publishing of obtained results in a written form and as a public presentation.					
<b>Brief outline of the course:</b>					
<b>Recommended literature:</b> With respect to the research problematics (article in journals, books).					
<b>Course language:</b> Slovak or English					
<b>Notes:</b>					
<b>Course assessment</b> Total number of assessed students: 101					
A	B	C	D	E	FX
99.01	0.99	0.0	0.0	0.0	0.0
<b>Provides:</b>					
<b>Date of last modification:</b> 01.12.2021					
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.					

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚFV/ DGS/21	<b>Course name:</b> Students` Digital Literacy
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 1.	
<b>Course level:</b> I.	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Summary evaluation based on ongoing assessment: 1. Practical ongoing assignments and their defense (at least 50% needed) 3. Active participation during face-to-face contact learning in classical or virtual classroom (3 absences allowed) and during online learning (no absence, uploading all individual ongoing assignments)	
<b>Learning outcomes:</b> The student should obtain and know to apply basic knowledge and skills in working with current digital technologies (mobile phone, tablet, laptop, web technologies): 1. according to the current European framework for the Digital competence DigComp and ECDL 2. for better and more effective learning, work and active life in higher education, later lifelong learning and further career prospects.	
<b>Brief outline of the course:</b> 01.-02. Basic digital skills, DigComp framework, ECDL - modern web browser and its personalization - security, privacy, responsible use of DT 03.-05. Search, collection and evaluation of digital content - scanning, audio recording and speech resolution, optical resolution (OCR) - digital notebooks (Google keep, Evernote, Onenote) - evaluation of digital resources (Google forms and sections) 06.-08. Editing and creating digital content - cloud and interactive documents (text and spreadsheet editors - Google, Microsoft, Jupyter) - work with pdf documents, e-books and videos (Kami, Google books, Screencasting) 09. - 10. Organization, protection and sharing of digital content - modern LMS and cloud storage (Google Classroom, Microsoft team, Google Drive, Dropbox) - time management (Google Calendar) 11.-13. Digital communication and cooperation	

- collaborative interactive whiteboards (Jamboard, Whiteboard)
- online presentations and online meetings  
(Google presentations, Powerpoint, Google meet, Microsoft teams)

**Recommended literature:**

1. Carretero Gomez, S., Vuorikari, R. and Punie, Y., DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use, Luxembourg, 2017, ISBN 978-92-79-68006-9, <https://www.ecdl.sk/>
2. Bruff, D. (2019). Intentional Tech: Principles to Guide the Use of Educational Technology in College Teaching (1st edition). Morgantown: West Virginia University Press.
3. Baker, Y. (2020). Microsoft Teams for Education. Amazon Digital Services.
4. Miller, H. (2021). Google Classroom + Google Apps: 2021 Edition. Brentford: Orion Edition Limited.

**Course language:**

slovak

**Notes:**

**Course assessment**

Total number of assessed students: 342

A	B	C	D	E	FX
76.32	7.02	4.09	0.88	11.11	0.58

**Provides:** doc. RNDr. Jozef Hanč, PhD.

**Date of last modification:** 26.01.2022

**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚTVŠ/ LKSp/13	<b>Course name:</b> Summer Course-Rafting of TISA River
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I., II., P	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Completion: passed Condition for successful course completion: - active participation in line with the study rule of procedure and course guidelines - effective performance of all tasks: carrying a canoe, entering and exiting a canoe, righting a canoe, paddling	
<b>Learning outcomes:</b> Content standard: The student demonstrates relevant knowledge and skills in the field, which content is defined in the course syllabus and recommended literature. Performance standard: Upon completion of the course students are able to meet the performance standard and: - implement the acquired knowledge in different situations and practice, - implement basic skills to manipulate a canoe on a waterway, - determine the right spot for camping, - prepare a suitable material and equipment for camping.	
<b>Brief outline of the course:</b> Brief outline of the course: 1. Assessment of difficulty of waterways 2. Safety rules for rafting 3. Setting up a crew 4. Practical skills training using an empty canoe 5. Canoe lifting and carrying 6. Putting the canoe in the water without a shore contact 7. Getting in the canoe 8. Exiting the canoe 9. Taking the canoe out of the water 10. Steering a) The pry stroke (on fast waterways) b) The draw stroke	

11. Capsizing 12. Commands	
<b>Recommended literature:</b> 1. JUNGER, J. et al. Turistika a športy v prírode. Prešov: FHPV PU v Prešove. 2002. ISBN 8080680973. Internetové zdroje: 1. STEJSKAL, T. Vodná turistika. Prešov: PU v Prešove. 1999. Dostupné na: <a href="https://ulozto.sk/tamhle/UkyxQ2lYF8qh/name/Nahrane-7-5-2021-v-14-46-39#!ZGDjBGR2AQtkAzVkAzLkLJWuLwWxZ2ukBRLjnGqSomICMmOyZN==">https://ulozto.sk/tamhle/UkyxQ2lYF8qh/name/Nahrane-7-5-2021-v-14-46-39#!ZGDjBGR2AQtkAzVkAzLkLJWuLwWxZ2ukBRLjnGqSomICMmOyZN==</a>	
<b>Course language:</b> Slovak language	
<b>Notes:</b>	
<b>Course assessment</b> Total number of assessed students: 252	
abs	n
36.11	63.89
<b>Provides:</b> Mgr. Dávid Kaško, PhD.	
<b>Date of last modification:</b> 29.03.2022	
<b>Approved:</b> doc. RNDr. Roman Soták, PhD.	

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚTVŠ/ KP/12	<b>Course name:</b> Survival Course
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week: 2 Per study period: 28</b> <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b>	
<b>Course level:</b> I., II., P	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Completion: passed Condition for successful course completion: - active participation in line with the study rule of procedure and course guidelines, - effective performance of all the tasks defined in the course syllabus	
<b>Learning outcomes:</b> Content standard: The student demonstrates relevant knowledge and skills in the field, which content is defined in the course syllabus and recommended literature. Performance standard: Upon completion of the course students are able to meet the performance standard and should: - acquire knowledge about safe stay and movement in natural environment, - obtain theoretical knowledge and practical skills to solve extraordinary and demanding situations connected with survival and minimization of damage to health, - be able to resist and face situations related to overcoming barriers and obstacles in natural environment, - be able implement the acquired knowledge as an instructor during summer sport camps for children and youth within recreational sport.	
<b>Brief outline of the course:</b> Brief outline of the course: 1. Principles of conduct and safety in the movement in unfamiliar natural environment 2. Preparation and guidance of a hike tour 3. Objective and subjective danger in the mountains 4. Principles of hygiene and prevention of damage to health in extreme conditions 5. Fire building 6. Movement in the unfamiliar terrain, orientation and navigation 7. Shelters 8. Food preparation and water filtering 9. Rappelling, Tyrolian traverse 10. Transport of an injured person, first aid	

**Recommended literature:**

1. JUNGER, J. et al. Turistika a športy v prírode. Prešov: Fakulta humanitných a prírodných vied PU v Prešove. 2002. 267s. ISBN 80-8068-097-3.
2. PAVLÍČEK, J. Člověk v drsné přírodě. 3. vyd. Praha: Práh. 2002. ISBN 8072520598.
3. WISEMAN, J. SAS: příručka jak přežít. Praha: Svojtka & Co. 2004. 566s. ISBN 8072372807.

**Course language:**

Slovak language

**Notes:****Course assessment**

Total number of assessed students: 489

abs	n
46.42	53.58

**Provides:** Mgr. Ladislav Kručanica, PhD.**Date of last modification:** 16.05.2023**Approved:** doc. RNDr. Roman Soták, PhD.

## COURSE INFORMATION LETTER

<b>University:</b> P. J. Šafárik University in Košice	
<b>Faculty:</b> Faculty of Science	
<b>Course ID:</b> ÚINF/ TYS1/15	<b>Course name:</b> Typographical systems
<b>Course type, scope and the method:</b> <b>Course type:</b> Practice <b>Recommended course-load (hours):</b> <b>Per week:</b> 2 <b>Per study period:</b> 28 <b>Course method:</b> present	
<b>Number of ECTS credits:</b> 2	
<b>Recommended semester/trimester of the course:</b> 4.	
<b>Course level:</b> I., N	
<b>Prerequisites:</b>	
<b>Conditions for course completion:</b> Satisfiable ability to correct mainly mathematical typesetting.	
<b>Learning outcomes:</b> To provide the basic information on principles for typesetting of documents containing mathematical formulas.	
<b>Brief outline of the course:</b> <ol style="list-style-type: none"><li>1. Principles for typesetting of documents containing mathematical formulas.</li><li>2. Typesetting of a plain text, special text symbols, using of text fonts.3</li><li>3. TeX macros.</li><li>4. Enumerations in text and footnote command. Parameter setting determining the appearance of the pages.</li><li>5. Typesetting of mathematical formulas in text and displays, aligning formulas.</li><li>6. Making tables and pictures.</li><li>7. Definitions, theorems, and proofs in a mathematical document.</li><li>8. Contents, bibliography, sections in a document.</li><li>9. Pictures.</li><li>10.-12. Project.</li></ol>	
<b>Recommended literature:</b> <ol style="list-style-type: none"><li>1. D. E. Knuth, The TeXbook, Computers and Typesetting, Addison-Wesley, Reading, Massachusetts, 1986.</li><li>2. M. Doob, Jemný úvod do TeXu, CSTUG, 1990; český překlad z "A Gentle Introduction to TeX" (text vo¾ane prístupný v CTAN archíve).</li><li>3. O. Ulrych, AMS-TeX za 59 minút, (verzia 1.0), Praha, 1989.</li><li>4. J. Chlebíková, AMS-TeX (verzia 2.0), Bratislava, 1992.</li><li>5. M. Spivak, The Joy of TeX, Amer. Math. Soc., 1986.</li><li>6. L. Lamport, LaTeX: A Document Preparation System, Addison-Wesley, Massachusetts, 1986.</li><li>7. L. Lamport, MakeIndex: An index processor for LaTeX, 17 February 1987.</li><li>8. J. Rybička, LaTeX pro začátečníky, Konvoj, Brno, 1995.</li><li>9. H. Partl, E. Schlegl, I. Hyna, P. Sýkora, LaTeX – Stručný popis.</li></ol>	

10. T. Oetiker, H. Partl, I. Hyna, E. Schlegl, M. Kocer, P. Sýkora, Ne příliš stručný úvod do systému LaTeX2e (neboli LaTeX2e v 73 minutách).
11. M. Goossens, F. Mittelbach, and A. Samarin, The LaTeX Companion, Addison-Wesley, Reading, Massachusetts, 1994. Kapitola 8 je volne prístupná v TeX archívoch (ch8.pdf). 4
12. G. Grätzer, Math into LaTeX, 3rd edition, Birkhäuser, Boston, 2000.

**Course language:**

Slovak.

**Notes:**

**Course assessment**

Total number of assessed students: 267

A	B	C	D	E	FX
50.56	16.85	19.48	5.99	6.37	0.75

**Provides:** prof. RNDr. Stanislav Krajči, PhD.

**Date of last modification:** 08.01.2022

**Approved:** doc. RNDr. Roman Soták, PhD.