CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ AOS1/15	**Course name:** Administration of OS
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 1., 3.	
Course level: I., II., N	
Prerequisities:	
Conditions for course completion: The condition for passing the course is successful realization of a project focused on the network services configuration.	
Learning outcomes: The result of the education is an understanding of the theoretical and practical background of Windows and Linux operating systems and selected network services.	
Brief outline of the course: 1. Management of Linux operating system (basic system tools for troubleshooting, system startup, network configuration), 2. File systems (general view), 3. File systems (RAID, LVM), 4. Web hosting services I. (basic concept, APACHE), 5. Web hosting services II. (SQL, HTTPS, security, NGINX), 6. File services I. (SAMBA, NFS), 7. File services II. (FTP), 8. Management of local computer network I. (routing, DHCP), 9. Management of local computer network II. (firewall), 10. VPN, 11. SSH and Proxy, 12. Kernel of the Linux operating system, 13. Administration of the Windows operating system.	
Recommended literature: 1. LPIC-1 Exam 102. LPI [online]. Canada: The Linux Professional Institute, 2021 [cit. 2021-9-22]. Dostupné z: https://learning.lpi.org/en/learning-materials/102-500/, 2. Linux - Dokumentační projekt [online]. 4. Praha: Computer Press, 2007 [cit. 2021-9-22]. Dostupné z: https://i.iinfo.cz/files/root/k/LDP_4.pdf, 3. The LPIC2 Exam Prep [online]. Sue B.V. - Open Sourced, 2021 [cit. 2021-9-26]. Dostupné z: https://lpic2book.github.io/src/	
Course language: Slovak or English	
Notes: Content prerequisites: understanding of fundamental concepts of operating systems, computer networks, basic skill in Linux shell (e.g. bash) and Powershell.	

Course assessment
Total number of assessed students: 36

A	B	C	D	E	FX
58.33	22.22	11.11	0.0	8.33	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Tomáš Bajtoš

Date of last modification: 26.09.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ANP/15	**Course name:** Algorithmic unsolved problems

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Satisfiable understanding of basic concepts.

Learning outcomes:
To introduce the student into most important results about non-existence of an algorithm for solving given problem.

Brief outline of the course:
1.--3. Axiomatic theories of natural numbers.
4.--6. Definibality of recursive functions.
7.--8. Tarski theorem on undefinability of truth in formalized arithmethic.
9. Godel incompletness theorem.
10. Algorithmic unsolvability of particular mathematical problems.
11. Non-existence of an algorithm for deciding the existence of a solution of Diophantine equations.
12. Reduction of problems and degrees of unsolvability.

Recommended literature:
J. Barwise ed., Handbook of Mathematical Logic, North Holland 1977S. C. Kleene, Introduction to the Metamathematics, Van Nostrand 1952, ruský preklad Moskva 1957.
E. Mendelson, Introduction to Mathematical Logic, Van Nostrand 1963, ruský preklad Nauka Moskva 1976.
M. Davis, Hilbert's Tenth Problem is Unsolvable, Amer. Math. Monthly,1973, 233--269.
Ju.V. Matijasevič, Diofantovy Množestva, Usp. Mat. Nauk, 27 (1972), 185--222
L. Bukovský, Algoritmicky neriešiteľné problémy, učebný text v elektronickej forma na sieti Novel, PF UPJŠ, Košice, 2003

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 27

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

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ APA1/21	**Course name:** Approximation algorithms
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week:** 3 **Per study period:** 42 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 3.	
Course level: II.	
Prerequisities:	
Conditions for course completion: Continuous assessment is awarded on the basis of the quality of homework given in lectures and continuous written test. Oral final exam.	
Learning outcomes: To learn basic conceptions of randomized algorithms and to classify the algorithms due to their error probability.	
Brief outline of the course: 1. Basic notions of Probability Theory. 2. Basic randomized computing models and its characterisations. 3. Las Vegas algorithms. 4. One sided error Monte Carlo algorithms. 5. Two sided bounded error Monte Carlo algorithms. 6. Two sided unbounded error Monte Carlo algorithms. 7. Classes of randomized algorithms with polynomial time complexity and relationships between them. 8. Optimisation problem, approximation algorithm, relative error, approximation ratio. 9. Special optimisation problems and approximation solutions. 10. Classification of optimisation problems based upon their approximations. 11. FPTAS. 12. PTAS. 13. TSP problem and its relaxations. 14. Unapproximability.	
Recommended literature: Hromkovič, J.: Algorithmics for Hard Problems, Introduction to Combinatorial Optimization, Randomization, Approximation, and Heuristics, Springer=Verlag 2004. Hromkovič, J.: Communication Protocols - An Exemplary Study of the Power of Randomness. In: Handbook on Randomized Computing, P.Pardalos, S.Rajasekaran, J.Reif, J.Rolim, Eds., Kluwer Publ., 2001. Hromkovič, J.: Design and analysis of ranodmized algorithms. Springer-Verlag, 2005.	

Hromkovič, J.: Einführung in die algorithmischen Konzepte der Informatik, Teubner, 2001.
Motwani R. and Raghavan P.: Randomized Algorithms. Cambridge University Press 1995.
Mitzenmacher M. and Upfal P.: Probability and Computing: Randomized Algorithms and Probabilistic Analysis. Cambridge University Press 2005.

Course language:
Slovak or English

Notes:
content prerequisites: basics of probability, basics of algorithms and data structures

Course assessment
Total number of assessed students: 105

A	B	C	D	E	FX
22.86	13.33	25.71	14.29	21.9	1.9

Provides: doc. RNDr. Ondrej Krídlo, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ UUI1/15	**Course name:** Artificial Intelligence and Cognitive Science

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

Number of ECTS credits: 3

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

Course level: II., N

Prerequisities:

Conditions for course completion:
Home work and written tests.
Final exam - written or oral.

Learning outcomes:
The goal of the course is to provide an overview of the extensive field of artificial intelligence and cognitive science. The student can opt to study individually a selected topic from the literature.

Brief outline of the course:
1. Definition and goals of Artificial intelligence and Cognitive Science. Natural intelligence. Intlligence of a machine vs. humnan agent.
2. Knowledge representation in AI (semantic networks, frames), reasoning.
3. Problem solving in state space - uninformed vs informed search, depth-first vs. breadth-first search.
4. Planning and decision making, logic constraints programming, machine learning.
5. Computer vision - image recognition (feature vs structure scene analysis), preprocessing, representation and description of image, object recognition.
6. Natural language processing, artificial neural networks, knowledge systems (structure, characteristics, feedforward vs feedback propagatiion during inference).
7. Genetic algorithms and artificial life, distributed AI and multiagent stystems.
8. Visual perception and cognition.
9. Auditory perception and cognition.
10. Memory, learning and attention.
11. language, thinking and consciousness.
12. Emotions, motivation, attention.
13. Motor system and crossmodal interactions.

Recommended literature:
1. Russell S.J., Norvig P: Artificial Intelligence: A Modern Approach (2nd Edition), Prentice Hall, 2002, ISBN: 0137903952
2. Negnevitsky Michael: Artificial Intelligence: A Guide to Intelligent Systems (2nd Edition), Addison Wesley, 2004, ISBN: 0321204662
3. Poeppel D., Mangun G., Gazzaniga M. (ed.): The Cognitive Neurosciences. 6th ed. MIT Press.

2020. ISBN-13: 978-0262043250

Course language:
Slovak or english

Notes:
Content prerequisities:
basic programing, neurobiology, cognitive psychology, or instructor's consent

Course assessment
Total number of assessed students: 98

A	B	C	D	E	FX
61.22	19.39	13.27	4.08	2.04	0.0

Provides: doc. Ing. Norbert Kopčo, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ BSIM1/14	**Course name:** Biomolecular Simulations

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 4.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Elaboration and presentation of the project on given actual subject. Development of own computer programs on project given at the exercises. Exam. Might be substituted by written exam including Q/A part.

Learning outcomes:
Introduction to actual problematics of biomolecular simulations.

Brief outline of the course:
Structural characteristics of biological polymers. Foldamers. Central dogma of molecular biology as flow of biological information. 3D-structure and function of foldamers. Recent view on enzyme mechanisms. Experimental methods of structure determination and their limitations. Empirical force fields and methods of classical molecular dynamics. Molecular dynamics and Monte Carlo methods - algorithms and paralelization. Ab initio molecular dynamics and hybrid approaches. Computational challenges in biomolecular simulations - simulations of chemical reactions, free energy evaluation, protein folding. Computational complexity, nontraditional approaches and heuristic approaches.

Recommended literature:
Actual literature recommended by lecturer.

Course language:

Notes:

Course assessment
Total number of assessed students: 56

A	B	C	D	E	FX
76.79	7.14	12.5	1.79	1.79	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 27.03.2020

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PSDU/16	**Course name:** Case studies in data mining
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 2 **Per study period:** 28 / 28 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course: 3.	
Course level: II.	
Prerequisities:	
Conditions for course completion: The realization of a project focused on case studies in data mining. Successful completion of the written and oral part of the exam focused on case studies in data mining.	
Learning outcomes: Solving practical tasks in the field of data mining. Basic concepts of data mining. Knowledge of data mining methods.	
Brief outline of the course: 1. Basic notions in data mining 2. Data preparation in data mining 3. Methods and algorithms of data mining 4. Methods and algorithms of data mining II 5. Extraction of knowledge from large data volumes 6. Case study analysis using data mining methods in different application areas 7. Case study analysis using data mining methods in different application areas II 8. Application of methods for automated analysis of large data volumes 9. Solving practical tasks using appropriate software tools 10. Solving practical tasks using appropriate software tools II 11. Solving practical tasks using appropriate software tools III 12. Testing data mining algorithms 13. Testing data mining algorithms II	
Recommended literature: [1] Watt, J., Borhani, R., Katsaggelos, A.K.: Machine learning refined: foundations, algorithms, and applications. Cambridge: Cambridge University Press, 2016. [2] Zhao, Y., Cen, Y.: Data Mining Applications with R. Elsevier Inc. 2014. [3] Han, J. and Kamber, M.: Data Mining Concepts and Techniques. 3rd Edition, Morgan Kaufmann, Burlington, 2011. [4] Witten, I.E., Frank, E.: Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, 2005.	

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 40

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

Provides: doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 14.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KKV1/21	**Course name:** Classical and quantum computations

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 2 **Per study period:** 42 / 28
Course method: present

Number of ECTS credits: 6

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

Course level: II., N

Prerequisities:

Conditions for course completion:
Successful completion of the subject is conditioned by proper acquisition of basic concepts, algorithms and models and demonstrating the ability to apply them creatively. The acquisition of knowledge takes place:
- continuously during the semester in the form of partial assignments,
- a written test during the semester,
- a written test at the exam,
- oral exam.

In order to receive an evaluation, it is necessary to obtain at least 50% of points from each of the three parts (assignments during the semester, written part of the exam, oral part of the exam). The detailed evaluation method is published in the AIS.

Learning outcomes:
By completing the subject, the student will get:
- knowledge of the classification and design of probabilistic algorithms,
- basic knowledge of the principles of quantum computers and their differences compared to classical computing models,
- knowledge and skills about the design and functioning of quantum computing and become familiar with the most well-known algorithms,

= basic quantum computer programming skills.

Brief outline of the course:
1. Introduction to quantum quantum computers. Basics of classical complexity theory.
2. Boolean circuits and their basic properties.
3. Probability algorithms.
4. BPP class and probability testing.
5. Basic properties of circuits and Fermat's test.
6. Miller - Rabin's test and the position of the BPP class in the hierarchy of complexity models.
7. Introduction to quantum computing and mathematical foundations of quantum theory.
8. Spectral representation of self-adjoint operators.
9. Quantum states and Hilbert vector spaces.
10. Basic quantum operators and basic quantum algorithms.

11. Quantum teleportation, superdense coding and Grover's algorithm.
12. Fourier transformation.
13. Shor's algorithm.

Recommended literature:

1. BERMAN,G.P., DOOLEN,G.D., MAINIERI, R., TSIFRINOVIC, V.I. Introduction to Quantum Computers. World Scientific, 2003.
2. GRUSKA, J. Quantum Computing. McGraw-Hill, 1999.
3. JOHNSON, G. A Shortcut Through Time: The Path to the Quantum Computer, Knopf 2003.
4. KITAEV, A.Y., SHEN, A.H., VYALYI, M.N. Classical and Quantum Computation. American Mathematical Society, 2002.
5. NIELSEN, M.A., CHUANG, I.L. Quantum Computation and Quantum Information. Cambridge University Press, 2000.
6. HIRVENSALO, M., Quantum Computing, Springer 2004

Course language:
Slovak or english

Notes:
Content prerequisites:
Linear algebra, Group theory, Probability theory, Theory of algorithms, Introduction to quantum computers.

Course assessment
Total number of assessed students: 93

A	B	C	D	E	FX
27.96	38.71	16.13	5.38	4.3	7.53

Provides: prof. RNDr. Gabriel Semanišin, PhD., Mgr. Viktor Olejár

Date of last modification: 25.07.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KMU1/15	**Course name:** Coding and multimedial data transition

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

Number of ECTS credits: 4

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

Course level: I., II.

Prerequisities:

Conditions for course completion:
Homeworks, active participation in laboratory exercises, midterm test.
Final written exam, oral examination.

Learning outcomes:
Understand the principles of lossy compression algorithms. Be able to apply different methods of quantization, prediction and difference procedures in lossy image and sound compression algorithms. Understand the JPEG and MPEG compression standards.

Brief outline of the course:
1. Formal model of coding and information transfer, compression ratio, criteria of uniquely decodable codes, block and prefix lossless codes.
2. Coding with known distribution of probabilities of occurrences of input characters, relation to entropy, Huffman construction, adaptive variants.
3. Arithmetic coding, integer, binary, adaptive versions, advantages and disadvantages of statistical codes.
4. Context coding, prediction methods, JBIG, JPEG-LS standards, PPM.
5. Dictionary compression methods, LZ77, LZW, use of transformations, BWT, ACB, dynamic Markov chains.
6. Principles of lossy compression, RD function, probabilistic and physiological models for efficient compression. Uniform and non-uniform scalar quantization, adaptive versions.
7. Vector quantization, optimization according to distribution function, compressors and expanders.
8. Differential techniques, prediction methods, adaptive quantization with prediction, DPCM method, use in audio and video coding.
9. Transformations in lossy coding, orthonormal representations, component analysis, two-dimensional transformations.
10. Discrete Fourier transform, use in image compression, JPEG encoder.
11. Subband filters, signal decomposition, signal synthesis from subbands, use in sound compression, psychoacoustic models, MP3, AAC coding.
12. Wavelet transforms, EZW encoder, use in audio and video coding.
13. Video compression, MPEG standards, adaptive algorithms for streaming and video conferencing.

Recommended literature:

1. D. Salomon: Data Compression, The Complete Reference, Springer, 2004.
2. K. Sayood: Introduction to Data Compression, Morgan Kaufmann, 2012.

Course language:

Slovak or English

Notes:

Course assessment

Total number of assessed students: 21

A	B	C	D	E	FX
28.57	4.76	28.57	19.05	19.05	0.0

Provides: doc. RNDr. Jozef Jirásek, PhD.

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ KOA/10	**Course name:** Combinatorial algorithms

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 1 **Per study period:** 42 / 14
Course method: present

Number of ECTS credits: 6

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

Course level: II.

Prerequisities:

Conditions for course completion:
The evaluation consists of a project (30 points) and an oral exam (70 points). The semester project consists of the elaboration of a computer program that returns the optimal solution or a acceptable approximation of the optimal solution, respectively, of a selected graph problem given by a suitable representation.

Learning outcomes:
Understanding of basic graph algorithm, the close connection between the theoretical and algorithmic aspects of discrete mathematics, ability to understand how selected algorithms can be derived from mathematical statements, ability to prove the correctness of algorithms.

Brief outline of the course:
Basic notions from graph theory.
Introduction to algorithms and complexity. Basic types of algorithms - sorting algorithms, search algorithms, greedy algorithms. NP-completeness.
Trees, spanning trees and rooted trees. Depth first search, breadth first search. Generating of all spanning trees of a graph, number of spanning trees. Minimum spanning tree problem (Kruskal, Prim, and Boruvka´s algorithms).
Distance in graphs. Shortest path problem in (non)oriented (weighted) graphs (various types of algorithms) and other variations of this problem.
Introduction to network analysis, critical path method.
Flows in networks, the max-flow min-cut theorem and related concepts.
Matchings, maximum matchings in bipartite and general graphs, finding a matching with maximum weight in bipartite graphs.
Location of centers in graphs, finding a center, absolute center, and a median of a graph.
Eulerian graphs and Chinese postman's problem.
Hamiltonian graphs, Travelling salesman problem and approximation algorithms for TSP.

Recommended literature:
1. G. Chartrand, O.R. Oellermann: Applied and Algorithmic Graph Theory, McGraw-Hill, Inc. New York 1993.
2. J.L. Gross, J. Yellen: Graph Theory and Its Applications, Chapman & Hall/CRC 2006.
3. D. Jungnickel: Graphs, Networks, and Algorithms, Springer-Verlag Berlin 2005.

4. J. Plesník: Grafové algoritmy, Veda Bratislava 1983.

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 103

A	B	C	D	E	FX
35.92	26.21	21.36	8.74	5.83	1.94

Provides: doc. RNDr. Roman Soták, PhD.

Date of last modification: 19.04.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KPPaPZ/KK/07	**Course name:** Communication and Cooperation

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Evaluation:
A condition for student evaluation is his active participation in the seminar. It is expected that the student will actively participate in the discussions and will express their positions and possible solutions.
The output for evaluation will be the development of a project in the form of a Power Point presentation or a video on a selected communication topic.

Learning outcomes:
The goal of the subject Communication, cooperation is the formation and development of students' language and communication skills through experiential activities.
The student can demonstrate an understanding of individual behavior in various communication contexts.
The student can describe, explain and evaluate communication techniques (cooperation, assertiveness, empathy, negotiation, persuasion) in practical contexts.
The student can apply these techniques in common communication schemes.

Brief outline of the course:
Communication
Communication theory
Non-verbal communication and its means
Verbal communication (basic components of communication, language means of communication) about active listening
Empathy
Short conversation and effective communication (principles and principles of effective communication)
Cooperation
About the basics of cooperation
About types, signs, types and factors of cooperation
Characteristics of the team (positions in the team)
Small social group (structure, development, characteristics of a small social group, position of the individual in the group)

About leadership (characteristics of the leader, management, leadership styles)

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 281

abs	n	z
98.22	1.78	0.0

Provides: Mgr. Ondrej Kalina, PhD., Mgr. Lucia Barbierik, PhD.

Date of last modification: 31.07.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ VKN2/22	**Course name:** Computational and cognitive neuroscience II

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

Number of ECTS credits: 5

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

Course level: II., N

Prerequisities:

Conditions for course completion:
Midterm exam
Final exam consisting of written and/or oral part

Learning outcomes:
Advanced topics in computational and cognitive neuroscience, and in the tools used in neuroscience.

Brief outline of the course:
1. Intro: Cognitive psychology, neural modeling.
Theme 1: Topics in cognitive and neural science
2. Neural basis of vision
3. Visual object recognition and visual scene analysis
4. Auditory cognition. Echo suppression. Auditory scene analysis
5. Cortical sound processing.
6. Other topics in the study of brain and main: thinking, consciousness, emotions, motivation
Topic 2: Modeling in cognitive and neural science
7. Intro
8. Connectionism, STM and LTM modeling
9. Additive and shunting neural networks.
10. Learning rule Outstar.
11. Adaptive resonance theory.
12. Statistical and decision-theory modeling
Topic 3: Current research at UPJS
13. Invited lecture

Recommended literature:
1. KANDEL, E. R., SCHWARTZ, J. H. and JESSELL, T.M.: Principles of Neural Science. McGraw-Hill, 2021 ISBN-13: 978-1259642234
2. Dayan P and LF Abbott: Theoretical Neuroscience - Computational and Mathematical Modeling of Neural Systems. MIT Press, 2005 ISBN-13: 978-0262541855
3. Thagard P: Mind: Introduction to Cognitive Science, 2nd Edition. Bradford Books. ISBN-13 : 978-0262701099

4. HERTZ, J., KROGH, A. and PALMER R. G.: Introduction to the theory of neural computation. Addison-Wesley 1991 ISBN-13: 978-0201515602

Course language:
Slovak or English

Notes:
Content prerequisites:
basics of neurobiology, cognitive psychology, linear algebra and differential equations, programing, or instructor's consent

Course assessment
Total number of assessed students: 9

A	B	C	D	E	FX
33.33	11.11	11.11	11.11	33.33	0.0

Provides: doc. Ing. Norbert Kopčo, PhD., RNDr. Keerthi Kumar Doreswamy

Date of last modification: 14.02.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ VYZ1/15	**Course name:** Computational complexity

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 1.

Course level: II., N

Prerequisities:

Conditions for course completion:
Oral examination.

Learning outcomes:
To give students theoretical background in computational complexity and theory of NP-completeness.

Brief outline of the course:
1: Introduction: the notion of computational complexity, computational time, computational model, example - the problem of sorting, computational complexity as an asymptotic function
2: Basic computational models: RAM and RASP computers, the cost of an elementary step on these computers, single-tape Turing machine, multi-tape Turing machine, nondeterministic variants of these computational models, transformations among these models with respect to the time complexity
3: The classes P and NP: basic definitions, presenting (un)undirected graphs on the input, 3COL – the set of all 3-colorable graphs is in NP, 2COL - the set of all 2-colorable graphs is in P, SAT – the set of satisfiable Boolean formulas is in NP, CNF-SAT - Boolean formulas in conjunctive normal form
4: Variants of P and NP: decision problem, the problem of finding a solution, optimization problem, polynomial conversions among different variants
5: NP-completeness: reducibility in polynomial time and its transitivity, definition of the NP-completeness and its basic properties
6: NP-completeness of SAT
7: Variants of SAT: 3CNF-SAT - satisfiability of Boolean formulas in 3-conjunctive normal form, kCNF-SAT, CNF-SAT - satisfiability in k-conjunctive (conjunctive) normal form, 2CNF-SAT is in P
8: 3COL and its variants: 3COL (the problem of coloring vertices of a graph with 3 colors) in NP-complete, consequently: for each k>3, kCOL (the problem of coloring with k colors) is NP-complete as well
9: Colorability of a planar graph with three colors: presenting a planar graph on the input, the proof of NP-completeness, coloring with a larger number of colors
10: Another NP-complete problems: Exact set cover, Clique, Vertex cover

11: Hamiltonian path: Hamiltonian path in a directed and in undirected graph
12: Subset-sum-like problems: Subset Sum - the problem of whether any subset of the integers sum to precisely a target sum, Partition - the problem of whether a given multiset of positive integers can be partitioned into two subsets with equal sums, a "more relaxed" version of Partition - achieving an approximate equality of the sums, distribution of tasks among K parallel processors
13: Beyond P a NP: a review of the basic complexity classes - L, NL, P, NP, PSpace , NPSpace, ExpTime, NExpTime, …, simulation of (non)deterministic space in (non)deterministic time, conversions in opposite directions
14: PSpace: QBF - true quantified Boolean formulas, prenex normal form, Pspace completeness of QBF, PSpace = NPSpace

Recommended literature:

1. J.E. Hopcroft, R.Motwani, J.D. Ullman: Introduction to automata theory, languages, and computation, Addison-Wesley, 2007.
2. M. Sipser: Introduction to the Theory of Computation, Thomson, 2nd edition, 2006.
3. L.A.Hemaspaandra, M.Ogihara: Complexity theory companion, EATCS series, texts in computer science, Springer-Verlag, 2002.
4. S. Arora, B. Barak: Computational Complexity: A Modern Approach, Cambridge Univ. Pess, 2009. 5. G.Brassard, P.Bradley: Fundamentals of algorithmics, Prentice Hall, 1996.
6. D.P.Bovet, P.Crescenzi: Introduction to the theory of complexity, Prentice Hall, 1994.
7. C. Calude and J. Hromkovič: Complexity: A Language-Theoretic Point of View, in G. Rozenberg and A. Salomaa, Handbook of Formal Languages II, Springer, 1997.

Course language:
Slovak or english

Notes:
Content prerequisities:
Basic notions from the theory of automata and formal languages.
Basic skills in programming and design of algorithms (in any programming language).
Basics knowledge in mathematical logic, set theory, and graph theory.

Course assessment
Total number of assessed students: 380

A	B	C	D	E	FX
57.11	15.79	13.16	6.84	6.84	0.26

Provides: prof. RNDr. Viliam Geffert, DrSc.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ ARP1/15	**Course name:** Computer architecture

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

Number of ECTS credits: 4

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

Course level: I., II., N

Prerequisities:

Conditions for course completion:
Homeworks, active participation in laboratory exercises, final written exam. Final oral examination.

Learning outcomes:
Obtain detailed information about the technical implementation of modern computer systems. Understand the principles of organization of work of processor and computer on concrete examples. Gain basic experience with programming at the level of machine instructions (Assembler language). Understand the current way a computer communicates with I / O devices. Students will get acquainted with the components of current computers, with their properties, connection, principle of operation and possibilities of use. They will be able to make informed decisions about the purchase of computer equipment, identify computer failures; make simpler repairs by replacing modules, including setting them correctly.

Brief outline of the course:
Milestones in computer organization, fundamental limitations. The representation of numbers and the implementation of floating point arithmetic. Combinatorial and sequential circuits, memory organization, RAMs and ROMs. Digital logic level architecture, data path timing, machine cycle. The microarchitecture level, microinstructions and microinstruction control. The instruction set architecture level, data types, addressing modes, instruction types. Instruction execution, pipelining, cache memory. I/O controllers, ports, interrupts, direct memory access. Multicore architectures, processor virtualization. Device drivers, operating system kernel, device-independent software. Laboratory practices and tutorials.

Recommended literature:
1. W. Stallings: Computer Organization and Architecture, Pearson, 2018
2. J. Ledin: Modern Computer Architecture and Organization, Packt Publishing, 2020
3. E. Upton, J. Duntemann, R. Roberts, T. Mamtora, B. Everard: Learning Computer Architecture with Raspberry Pi, Wiley, 2016

Course language:
Slovak or English

Notes:

Content prerequisities: understanding of fundamental concepts of computer architecture and design within the scope of a standard undergraduate course.
The course is not organized annually.

Course assessment
Total number of assessed students: 60

A	B	C	D	E	FX
16.67	18.33	16.67	23.33	18.33	6.67

Provides: doc. RNDr. Jozef Jirásek, PhD., RNDr. Juraj Šebej, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/MSSI/15	**Course name:** Computer science II.

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: II.

Prerequisities: (ÚINF/KRP1/15 or ÚINF/OPS1/15) or (ÚINF/LAD1/15 and ÚINF/AIS1/15) or (ÚINF/STU1/16 and (ÚINF/NEU/24 or ÚINF/VKN/24)) or (ÚINF/KKV1/21 and ÚMV/KOA/10)

Conditions for course completion:
Appropriate knowledge and competencies from the profile subjects of the study program, demonstrating the ability to synthesize the acquired knowledge and procedures and apply them to the problems of computer science.

Learning outcomes:
Verification of acquired student competencies in accordance with the graduate profile.

Brief outline of the course:
The state exam is focused on one of the following areas:
1. Computer systems and networks, security of computer systems.
2. Information and knowledge systems.
3. Computational complexity, computational models.
4. Methods of artificial intelligence.
The examination may also include the basic principles and relationships between the topics of compulsory subjects and possible connections between these topics and the final thesis.

Recommended literature:
Information sources recommended within individual profile subjects.

Course language:
Slovak language or English language

Notes:

Course assessment
Total number of assessed students: 65

A	B	C	D	E	FX
49.23	20.0	18.46	9.23	3.08	0.0

Provides:

Date of last modification: 14.03.2023

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ KRP1/15	**Course name:** Cryptographic protocols

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

Number of ECTS credits: 4

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

Course level: I., II., N

Prerequisities:

Conditions for course completion:
Homeworks, active participation in laboratory exercises, presentation of a selected topic at a course seminar. Final written exam.

Learning outcomes:
Understand the problems of designing secure cryptographic protocols for authentication and key management. Know the ways to compromise them and be able to apply methods of proving their correctness. Control some automated verification tools. Understand and be able to apply advanced cryptographic techniques in various application fields - signature schemes, electronic banking, electronic voting. Orientation in current problems of implementation of cryptographic protocols.

Brief outline of the course:
Authentication and key establishment using shared and public key cryptography, key agreement protocols, conference key agreement, zero-knowledge protocols, provable security. Protocol architecture and formal definition, goals for authentication and key establishment, formal verification. Digital signature, implementation, trust distribution.
The final seminar with presentations on selected current topics - electronic banking, electronic voting, secure communication ...

Recommended literature:
1. Colin Boyd, Anish Mathuria: Protocols for Authentication and Key Establishment, Springer, 2020
2. Douglas R. Stinson, Maura B. Paterson: Cryptography: Theory and Practice, Fourth Edition, Chapman & Hall/CRC, 2018
3. Paul C. van Oorschot: Computer Security and the Internet: Tools and Jewels, Springer, 2020
4. Peter Ryan, Steve Schneider: Modeling and Analysis of Security Protocols, Addison-Wesley, 2001

Course language:
Slovak or English

Notes:

Content prerequisities: understanding of fundamental cryptographic concepts and primitives (as taught in the course KRS/15 or in the scope of the textbook "Understanding Cryptography" by Christof Paar and Jan Pelzl).
The course is not organized annually.

Course assessment
Total number of assessed students: 27

A	B	C	D	E	FX
29.63	7.41	14.81	29.63	14.81	3.7

Provides: doc. RNDr. Jozef Jirásek, PhD., RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/DIPa/18	**Course name:** Diploma thesis project

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
regular consultaions with diploma thesis supervisor about the progress of diploma project development accornig to agreed schedule, regular consultations, study of available resources connected with the diploma thesis assignments, first results

Learning outcomes:
Student understands the methods of investigation and he/she gains first results.

Brief outline of the course:
The subject is tied to the diploma thesis. The evaluation is based on student's approach to the diploma thesis and the partially achieved results.

Recommended literature:
- Recommended literature that is included in the diploma thesis assignments
- Regulations for diploma thesis preparation
- Template for diploma thesis

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 53

abs	n
100.0	0.0

Provides:

Date of last modification: 12.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ DIPb/18	**Course name:** Diploma thesis project

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
regular consultaions with diploma thesis supervisor about the progress of diploma project development accornig to agreed schedule, regular consultations

Learning outcomes:
Student has enough knowledge to prepare a theoretical part of the diploma thesis and for practical part based on the problem analysis and drawing conclusions.

Brief outline of the course:
The subject is tied to the diploma thesis. The evaluation is based on student's approach to the diploma thesis and the partially achieved results.

Recommended literature:
- Recommended literature that is included in the diploma thesis assignments
- Regulations for diploma thesis preparation
- Template for diploma thesis

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 51

abs	n
96.08	3.92

Provides:

Date of last modification: 12.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ DPO/22	**Course name:** Doctoral Thesis and its Defence
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 16	
Recommended semester/trimester of the course:	
Course level: II.	
Prerequisities: ÚINF/SDI1c/15	
Conditions for course completion: The diploma 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 process of supervision and in the process of thesis defense. Failure to do so is reason for disciplinary action.	
Learning outcomes: The diploma thesis demonstrates mastery of extended 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. Student demonstrates the ability of independent professional work in terms of content, formal and ethical. Further details on the diploma thesis are determined by Directive no. 1/2011 on the basic requirements of final theses and the Study Regulations of UPJŠ in Košice for the 1st, 2nd and combined 1st and 2nd degree.	
Brief outline of the course: 1. Elaboration of the diploma thesis in accordance with the instructions of the supervisor. 2, Presentation of the results of the diploma thesis before the examination commission. 3. Answering questions related to the topic of the diploma thesis within the discussion.	
Recommended literature: The recommended literature is determined individually in accordance with the topic of the diploma thesis.	
Course language: Slovak and optionally English.	
Notes:	

Course assessment
Total number of assessed students: 6

A	B	C	D	E	FX
50.0	0.0	33.33	16.67	0.0	0.0

Provides:

Date of last modification: 19.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/FAN/15	**Course name:** Forensic analysis

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

Number of ECTS credits: 4

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

Course level: I., II.

Prerequisities: ÚINF/BPD1/15

Conditions for course completion:
The condition for passing the course is: 1. Homeworks (25% of the total number of points), 2. Written final theoretical exam (40% of the total number of points), 3. Successful realization of a project focused on the forensic analysis of a specific case (35% of the total number of points).

Learning outcomes:
The result of the education is an understanding of the technical, legal and procedural methods and procedures in digital forensic analysis, from the identification and acquiring of digital evidence to their usage in security incident handling or in civil or criminal proceedings.

Brief outline of the course:
1. Introduction to forensic analysis, 2. Legal and ethical aspects of forensic analysis, 3. Security incident handling and the first response, 4. Live forensic analysis, 5. Identification and acquiring of digital evidence, 6. Extraction of digital evidence and forensic images handling, 7. Analysis of the Windows operating system I. (basic aspects), 8. Analysis of the Windows operating system II. (user data), 10. Analysis of Linux operating system, 11. Network forensic analysis, 12. Forensic analysis of mobile devices, 13. Evaluation and presentation of digital evidence analysis, 14. OSINT.

Recommended literature:
1. ARNES, André. Digital Forensics. 1. Wiley, 2017. ISBN 978-1119262381, 2. FORTUNA, Andrea. The little handbook of Windows Memory Analysis: Just some thoughts about memory, Forensics and Volatility!. 1. 2019. ISBN 978-1798027400, 3. CARRIER, Brian. File System Forensic Analysis. 1. Addison-Wesley Professional, 2005. ISBN 978-0321268174, 4. CARVEY, Harlan. Investigating Windows Systems. 1. Academic Press, 2018. ISBN 978-0128114155.

Course language:
Slovak or English

Notes:
Content prerequisites: understanding of fundamental concepts of operating systems, computer networks, basic skill in Linux shell (e.g. bash) and Powershell.

Course assessment
Total number of assessed students: 24

A	B	C	D	E	FX
33.33	33.33	16.67	8.33	8.33	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Tomáš Bajtoš

Date of last modification: 04.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ZNA1/21	**Course name:** Foundations of knowledge systems

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Test of theoretical knowledge in the middle of the semester.
Written and oral exam.

Learning outcomes:
The goal is to teach students some advanced applications of logic into computer science, especially in database and knowledge systems.

Brief outline of the course:
1. logic formulas, semantic, models and logical inference
2. Herbrand model, construction and usability
3. SLD-resolution and query, SLD trees
4. logic and databases, relational databases, deductive databases
5. logic and expert systems
6. basic notions of Lattice Theory and Formal Concept Analysis (FCA)
7. basic notions of Fuzzy logic and Fuzzy extension of FCA
8. basic algorithms of FCA
9. optimal table decomposition, factorisation
10. intercontextual structures, bonds
11. Direct products and choosing of optimal bonds
12. Applications on real data

Recommended literature:
Shawn Hedman. A first course in logic: An introduction to model theory, proof theory, computability and complexity. Oxford university press, ISBN 0–19–852980–5, 2006.
Shan-Hwei Nienhuys-Cheng, Ronald de Wolf. Foundations of Inductive Logic Programming. Springer-Verlag, ISBN 3-540-62927-0, 1997.
Kristian Kersting. An Inductive Logic Programming Approach to Statistical Relational Learning, IOS Press, ISBN 1-58603-674-2, 2006.
Nilsson U., Maluszynski J.: Logic, Programming and Prolog, John Wiley & Sons Ltd. 1995.
Bělohlávek R.: Fuzzy Relational Systems: Foundations and Principles. Kluwer, Academic/Plenum Publishers, New York, 2002.
Ganter B., Wille R.: Formal Concept Analysis: Mathematical Foundations, Springer Berlin, 1999.

Course language:
Slovak or English

Notes:
content prerequisites: basics of logic, introduction to computer science

Course assessment
Total number of assessed students: 83

A	B	C	D	E	FX
55.42	2.41	18.07	7.23	13.25	3.61

Provides: doc. RNDr. Ondrej Krídlo, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ ANO/15	**Course name:** Image analysis

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

Number of ECTS credits: 4

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

Course level: I., II.

Prerequisities:

Conditions for course completion:
Rules of the final examination: two parts of the final exam - theoretical oral exam and disscussion on the practical assignment.
Rules to pass the subject: Get at least 50% from both parts of the final exam. The grade will be calculated based on the result from the final exam and assignments during semester.

Learning outcomes:
To examine selected computer vision methods. To get an ability to implement chosen solutions and evaluate them on practical problems.

Brief outline of the course:
1. Introduction to computer vision, scanning, representation, and properties of images, noise.
2. Image processing, point operators, convolution, Fourier transformation, binary iamge, mathematical morphology.
3. Segmentation, edge detection, Hough transform, active contour model.
4. Recognition, features, machine learning.
5. Textures, image alignment and stitching.
6. Third dimension in images, epipolar geometry, depth information, 3D reconstruction.
7. Structure from motion, Kalman filter, particle filter, SLAM.

Recommended literature:
1. SZELISKI, Richard. Computer Vision: Algorithms and Applications. London: Springer, 2010. Texts in computer science. ISBN 978-1-84882-934-3.
2. ŠONKA, MIlan, HLAVÁČ, Václav a Roger BOYLE: Image Processing, Analysis, and Machine Vision. Cengage Learning, 2014. ISBN 978-1-133-59360-7.
3. ŠONKA, Milan a Václav HLAVÁČ. Počítačové vidění: první česká kniha o zpracování digitalizovaných obrazů ; rozpoznávání objektů v obrazech ; analýza trojrozměrných a pohybujících se objektů ; příklady aplikací počítačového vidění. Praha: Grada, 1992. Nestůjte za dveřmi (Grada).
4. ŠIKUDOVÁ, Elena. Počítačové videnie: detekcia a rozpoznávanie objektov. Praha: Wikina, [2014]. ISBN 978-80-87925-06-5.

Course language:

Slovak language. English is required for reading recommended literature and OpenCV library documentation.

Notes:

Course assessment
Total number of assessed students: 52

A	B	C	D	E	FX
40.38	17.31	17.31	7.69	17.31	0.0

Provides: RNDr. Miroslav Opiela, PhD.

Date of last modification: 22.09.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/MIN1/15	**Course name:** Informatics for medicine

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Conditions for continuous evaluation: activity on excercises, homeworks, test
Conditions for the final evaluation: Oral and written exam

Learning outcomes:
To present an application of computer science in medicine domain with emphasis on the specific conditions for so-called safety-relevant domain.

Brief outline of the course:
Introduction to medical informatics. Clinical workflow. Healthcare services. SW projects in the medical domain. Development methodologies in SW projects in the medical domain. Agile methods in medical projects, eXtreme programming, fast methods versus robust methods. Development tools in SW projects in the medical domain.

Recommended literature:
1. Company literature of SIEMENS. Available on-line: <http://www.siemens.com>
2. Company literature of SYNGO. Available on-line: <http://www.syngo.com>

Course language:
Slovak or English

Notes:
Content prerequisities: foundations of software engineering

Course assessment
Total number of assessed students: 87

A	B	C	D	E	FX
78.16	21.84	0.0	0.0	0.0	0.0

Provides: Ing. Marián Zorkovský

Date of last modification: 17.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/MIN2/15	**Course name:** Informatics for medicine

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 4.

Course level: I., II.

Prerequisities: ÚINF/MIN1/15

Conditions for course completion:
Conditions for continuous evaluation: homeworks, test
Conditions for the final evaluation: oral and written part of exam

Learning outcomes:
Point out the application of informatics in the medical domain, taking into account the specifics for the so-called safety-relevant domain.

Brief outline of the course:
Medical standards and protocols. Integration testing. Project management in the medical domain. Quality management in the medical domain. CM - configuration management. Organization and management of the company's SW.

Recommended literature:
1. Company literature of SIEMENS. Available on-line: <http://www.siemens.com>
2. Company literature of SYNGO. Available on-line: <http://www.syngo.com>

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 13

A	B	C	D	E	FX
46.15	23.08	7.69	7.69	15.38	0.0

Provides: Ing. Marián Zorkovský

Date of last modification: 17.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/AIS1/15	**Course name:** Information systems architecture

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Work on project.
Written and oral examination

Learning outcomes:
To provide an overview of the modern methodologies of information system development. To introduce the fundamental principles of conceptual modelling of information systems.

Brief outline of the course:
System, information system, information pyramid. Conceptualisation of information systems. ISO model of the architecture of an information system. Introduction to MDA, software development life cycle based on MDA. Model, metamodel, modelling language. Model transformation and marking models. Entity types. Relationship types. Cardinality constraints. Integrity constraints. Taxonomies. Domain events. Use cases. State transition diagrams.

Recommended literature:
1. http://www.omg.org
2. Ian Sommerville, Software Engineering, Addison-Wesley 2005
3. Anneke Kleppe, Wim Bast, Jos B Warmer, MDA Explained, the Model Driven Architecture, Addison-Wesley 2003
4. Scott Berkun, The Art Of Project Management, O Reilly 2005

Course language:
Slovak or English

Notes:
Content prerequisities: Software engineering, UML, OOP

Course assessment
Total number of assessed students: 190

A	B	C	D	E	FX
21.05	30.0	25.79	8.42	11.05	3.68

Provides: prof. RNDr. Gabriel Semanišin, PhD., RNDr. Viktor Pristaš

Date of last modification: 23.11.2021
Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ TIK1/22	**Course name:** Information theory, encoding

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Satisfiable knowledge of basic notions

Learning outcomes:
To understand principles of lossless coding and entropy and their mutual relationship.

Brief outline of the course:
1. Word and language
2. Decodable codes
3. Prefix-free codes
4. Krafto-McMillan inequality
5.-7. Entropy
8.-9. Price of code sequence
10. Shannon's theorem
11. Fano's code sequence
12. Huffman's optimal code sequence

Recommended literature:
1. D. Hankersson, G. Harris, P. Johnson: Introduction to Information Theory and Data Compression, CRC Pr., 1998.
2. J. Adámek: Kódovaní a teorie informace, Vydavatelství ČVUT, Praha 1994
3. J. Černý: Entrópia a informácia v kybernetike, Alfa 1981

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 124

A	B	C	D	E	FX
58.87	19.35	12.1	4.03	0.0	5.65

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 08.02.2022
Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ IDS18/18	**Course name:** Introduction to data science

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Evaluation is based on the practical and the theoretical part of the exam. Practical exam consists of the defense of the semestral project, based on the report the student submit until the end of the semester. Student can get at most 50 points from the practical part. The theoretical part consists of answers to questions related to the theory of underlying methods presented during the course of the lecture. From the theoretical part the student can get at most 50 points. The final grade is based on the sum of the points the student has got for the practical and the theoretical part. To pass the course, the student need to get at least 60 points.

Learning outcomes:
Knowledge of basic principles and concepts of data mining, practical experience with working on a data mining project, such that, ability to analyze the problem and available data, pre=processing of data and modeling, ability to evaluate the success of a data mining project and application of its results into production.

Brief outline of the course:
1) Introduction: History of data mining, CRISP-DM method.
2) Clustering: similarities of various data types, agglomerative clustering, k-means clustering, DBSCAN, evaluation of clusters.
3) Frequent patterns: frequent itemsets, algorithms of Apriori, Eclat and FP-Growth, association rules, frequent sequences, evaluation of the quality of patterns.
4) Prediction: the task of regression and classification, linear model, parameters and hyper-parameters of models, regularization, bias and variance, cross-validation, Bayes model, discriminant function, hyper-parameter tuning, quality of models.
5) Recommendation techniques: explicit and implicit feedback, collaborative filtering, recommendation via matrix factorization, quality of recommendation.
6) Data pre-processing: data quality, noise, missing values, transformation of data, normalization, attribute selection, dimension reduction, sampling.

Recommended literature:
- Peter Flach (2012). Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press.

- Jiawei Han, Micheline Kamber, Jian Pei (2011). Data Mining: Concepts and Techniques. Morgan Kaufmann.
- Pang-Ning Tan, Michael Steinbach, Vipin Kumar (2005). Introduction to Data Mining. Addison Wesley.
- João Moreira, Andre de Carvalho, Tomáš Horváth (2018). A General Introduction to Data Analytics. Wiley.

Course language:
Slovak or English

Notes:
Content prerequisities: derivation, working with vectors and matrices, programming, data structures

Course assessment
Total number of assessed students: 9

A	B	C	D	E	FX
55.56	11.11	0.0	22.22	11.11	0.0

Provides: RNDr. Tomáš Horváth, PhD.

Date of last modification: 12.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PAI1/21	**Course name:** Legal aspects of informatics

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

Number of ECTS credits: 3

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

Course level: I., II.

Prerequisities:

Conditions for course completion:
The condition for passing the course is the final written exam (score at least 50%).

Learning outcomes:
The result of the education is an understanding of the necessary knowledge in the legal aspects of information and communications technologies (ICT law), especially data protection, criminal aspecs of IT, intellectual property, information society services.

Brief outline of the course:
1. Introduction to information technology law, 2. Electronic legal acts and electronic signature, 3. Trust-building services, 4. Electronic commerce I. - introduction to electronic commerce, information society services, types of electronic contracts, legal aspects of e-shops, concluding contracts, 5. Electronic commerce II. - consumer protection, 6. Protection of privacy and personal data I. - protection of personality, definition of personal data, processing of personal data, rights of data subjects, 7. Protection of privacy and personal data II. - online identifiers - IP addresses, cookies, 8. Digital single market - digital single market - geoblocking, shared economy, 9. Liability on the Internet, 10. Intellectual property law I. - industrial property law, copyright rights, 11. Intellectual property law II. - legal aspects of computer programs, databases, license agreements, open licenses, 12. Computer crime I., 13. Computer crime II., 14. Cyber and information security.

Recommended literature:
1. HUSOVEC, Martin, Matúš MESARČÍK a Jozef ANDRAŠKO. Právo informačných a komunikačných technológií 1. Bratislava: TINCT, 2021. ISBN 9788097383701, 2. ANDRAŠKO, Jozef, Martin DAŇKO, Petra DRAŽOVÁ, Zoltán GYURÁSZ, Matúš MESARČÍK, Rastislav MUNK a Soňa SOPÚCHOVÁ. Právo informačných a komunikačných technológií 2. Bratislava: TINCT, 2021. ISBN 9788097383725, 3. HUČKOVÁ, Regina, Diana TREŠČÁKOVÁ a Laura RÓZENFELDOVÁ. Právo informačných a komunikačných technológií. Košice: Univerzita Pavla Jozefa Šafárika v Košiciach, 2020. ISBN 9788081529108.

Course language:
Slovak

Notes:

Course assessment Total number of assessed students: 77					
A	B	C	D	E	FX
20.78	22.08	18.18	11.69	22.08	5.19
Provides: doc. RNDr. JUDr. Pavol Sokol, PhD.					
Date of last modification: 04.01.2022					
Approved: prof. RNDr. Stanislav Krajči, PhD.					

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ LAD1/15	**Course name:** Logical aspects of databases

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II., N

Prerequisities:

Conditions for course completion:
Satisfiable understanding of basic concepts.

Learning outcomes:
Ability to correctly formalize databases.

Brief outline of the course:
1.-3. Basic concepts of logic – a symbol, a term, a formula, an interpretation
4. Formalization of a table and a database
5. Conjunctive queries
6. Conjunctive calculus
7. Relations between conjunctive calculus and conjunctive queries
8.-10. Relational algebra
11.-12. Relations of different models of databases

Recommended literature:
https://ics.upjs.sk/~krajci/skola/vyucba/ucebneTexty/LAD-presentation.pdf

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 94

A	B	C	D	E	FX
44.68	18.09	17.02	10.64	7.45	2.13

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ STU1/16	**Course name:** Machine learning

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
The realization of a project focused on the application of machine solution methods in solving practical tasks. Successful completion of two written tests based on machine learning, probabilistic learning, classification tasks. Successful completion of the written and oral part of the exam based on machine learning, probabilistic learning, classification tasks.

Learning outcomes:
The result of education is an understanding of the basic principles of machine learning. The student will gain the ability to analyze data using selected methods of machine learning and artificial intelligence. Can work with a selected tool for modeling neural networks.

Brief outline of the course:
1. Learning algorithms, concepts, hypotheses. Training and learning, learning by construction and numbering.
2. Boolean formulas and their representation. Learning algorithms for monocells. Hypothesis space representation.
3. Probabilistic learning. An estimate of the number of examples needed to achieve some accuracy and credibility.
4. Probabilistic learning and consistent algorithms.
5. Relationships between attribute sets and predicted variables. Regression. Linear modeling using the least squares method of deviations.
6. Linear modeling, generalization, nonlinear responses from a linear model, data validation. Classification.
7. Linear modeling using probability theory and maximum confidence.
8. VC (Vapnik - Cervonenkis) dimension of its relation to perceptrons.
9. Bayesian approach to learning. SVM.
10. Clustering.
11. Hidden Markov models.

Recommended literature:
1. ANTHONY, Martin a Norman BIGGS. Computational Learning Theory, Cambridge University Press, 1997. ISBN 978-0521599221.
2. BROWNLEE, Jason. Machine Learning Mastery With Python. 2019.

3. WATT, Jeremy, Reza BORHANI a Aggelos K. KATSAGGELOS. Machine learning refined: foundations, algorithms, and applications. Cambridge: Cambridge University Press, 2016. ISBN 978-1-107-12352-6.

Course language:
Slovak language or English language

Notes:

Course assessment
Total number of assessed students: 61

A	B	C	D	E	FX
36.07	18.03	27.87	9.84	8.2	0.0

Provides: doc. RNDr. Ľubomír Antoni, PhD., doc. RNDr. Gabriela Andrejková, CSc., RNDr. Zoltán Szoplák, RNDr. Šimon Horvát, PhD.

Date of last modification: 31.03.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/MLO/22	**Course name:** Mathematical logic

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Knowledge of studied notions will be evaluated.

Learning outcomes:
Understanding of basic concepts of mathematical logic.

Brief outline of the course:
1.--2. Boolean algebra
3.--4. Filters and ultrafilters
5.--6. Rasiowa-Sikorski's theorem
7. Safe substitution
8. Lindenbaum-Tarski's algebra
9.--11. Syntactical interpretation
12. Completeness

Recommended literature:
1. Krajči S., https://ics.upjs.sk/~krajci/skola/vyucba/ucebneTexty/logika-stromy.pdf
2. Goldstern M., Judah H.: The Incompleteness Phenomenon, A New Course in Mathematical Logic, A K Peters, Wellesley, Massachusetts, 1995

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 9

A	B	C	D	E	FX
33.33	11.11	11.11	22.22	22.22	0.0

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 12.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KF/FMPV/22	**Course name:** Methodology of Science 1

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: II.

Prerequisities:

Conditions for course completion:
Attendance: A student may have one unexcused absence in seminar at the most. Absence in more than one seminar must be reasoned and substituted by consultations. Conditions of continuous and final control: during the semester a student is continuously checked and assessed according to his/her activity. To be awarded the credits, a student must pass a test from knowledge obtained in the lectures and seminars. Results of the test will make up the final grade.

Learning outcomes:
The course is aimed at getting familiar with the basic issues of methodology and philosophy of science. Significant part will be devoted to presenting the main concepts of the philosophy of science in the 20th century and this aim will be achieved by reading the source and interpretive texts.

Brief outline of the course:
• Falsificationism and critical realism by K. R. Popper.
• Development and critique of the Popper's concept.
• Understanding the science development in the work by T. S. Kuhn.
• Methodology of scientific research programmes of I. Lakatos.
• Methodological anarchism of P. Feyerabend.
• W.V.O. Quine – the issue of relation between theory and empiricism.

Recommended literature:
BILASOVÁ, V. – ANDREANSKÝ, E.: Epistemológia a metodológia vedy. Prešov: FF PU 2007.
FAJKUS, B.: Filosofie a metodologie vědy. Praha: Academia 2005.
BEDNÁRIKOVÁ, M. Úvod do metodológie vied. Trnavská univerzita: Trnava 2013.
DÉMUTH, A. Filozofické aspekty dejín vedy. Trnavská univerzita: Trnava 2013.
FEYERABEND, P.: Proti metodě. Prel. J. Fiala. Praha: Aurora 2001.
KUHN, T. S.: Štruktúra vedeckých revolúcií. Prel. Ľ. Valentová. Bratislava 1982.

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 6

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

Provides: prof. PhDr. Eugen Andreanský, PhD.

Date of last modification: 01.02.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ MPJ1/15	**Course name:** Modern programming languages

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

Number of ECTS credits: 4

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

Course level: I., II.

Prerequisities:

Conditions for course completion:
Demonstration of adequate mastery of the content standard of the subject in the ongoing and final evaluation, the ability to formulate a problem in the acquired terminology and solve it within a project.
Written works during the semester, project.
Written and oral exam.

Learning outcomes:
During the completion of the course, the student will master the use of standard and more sophisticated programming models and techniques within .NET.

Brief outline of the course:
1) Common type system, boxing, Common Intermediate Language (CIL), Common Language Runtime (CLR) - .NET Framework.
2) Imperative and procedural programming. OOP, libraries, classes, assembly, reflection and Module.
3) Generic programming - parametric polymorphism.
4) Functional programming - lambda expressions.
5) LINQ and querying data structures.
6) Event programming - delegates.
7) Communication between windows. Design of new controls.
8) Graphic primitives and Chart.
9) Database applications, ADO.NET, Entity Framework.
10) Vector programming - operator overloading, indexer.
11) MS Office programming using C#.
12) .NET Core. Tuple vs record.

Recommended literature:
1. J. Glynn, Cs. Török et al, Professional Windows GUI Programming Using C#, 2002, Wrox, ISBN-10:‍1861007663
2. A. Troelsen , Ph. Japikse, Pro C# 9 with .NET 5 : Foundational Principles and Practices in Programming, 2021, Apress, ISBN10 1484269381

3. J. Albahari, C# 9.0 in a Nutshell : The Definitive Reference, 2021, O'Reilly Media, ISBN10 1098100964
4. C. Solis, C. Schrotenboer, Illustrated C# 7 : The C# Language Presented Clearly, Concisely, and Visually, 2018, Apress, ISBN10 1484232879

Course language:
Slovak or English.

Notes:
If necessary, teaching, mid-term and final evaluation will be by distance form.

Course assessment
Total number of assessed students: 157

A	B	C	D	E	FX
15.92	19.11	26.11	20.38	17.2	1.27

Provides: doc. RNDr. Csaba Török, CSc.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ NEU1/15	**Course name:** Neural networks

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

Number of ECTS credits: 5

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

Course level: II.

Prerequisities:

Conditions for course completion:
Successful realization of a project focused on the applications of neural networks. Successful completion of two written tests at 60% which are focused on various architectures of neural networks and the connections with other areas of computer science - automata, fuzzy logic. Demonstration of knowledge focused on neural network methods and their application in the exam.

Learning outcomes:
Knowledge of basic paradigms of neural networks. Knowledge about applications of neural networks in various fields. Ability to assess the applicability of neural networks in solving algorithmic problems.

Brief outline of the course:
1. Motivational examples. Mathematical model of neuron and neural network. Perceptrons. Linear separable objects, adaptation process (learning), perceptron convergence, multiple perceptrons.
2. Computational power of single input neural networks, neuromata. Simulation of automata using neural networks.
3. Classical layer neural networks, hidden neurons, adaptation process (learning), feedback method backpropagation and its variants.
4. Recurrent neural networks, algorithm for training recurrent networks. Examples of use.
5. Self-organization of neural networks and Kohonen neural networks, learning algorithm, use.
6. Networks with local neurons, RBF networks, networks with semi - local units. RBF approximations
networks.
7. Written test I. Neuromat for regular language. neural network to deterministic finite state automaton, recurrent backpropagation algorithm and its applications, Kohonen ane RBF neural networks.
8. Convolutional neural networks. Basic knowledge of convolution. Convolutional neural networks for image processing.
9. Deep neural networks and their use.
10. Graph neural networks, structure, learning and applications.
11. Deductive systems of fuzzy logic. Fuzzy neural networks and their use. Fuzzy controller.

12. Universal approximation using neural networks, Kolmogorov theorem. Approximation properties layered neural networks.
13. Solving practical problems using neural networks.
14. Written test II. Convolution and convolutional neural networks, deep neural networks, graph neural networks, constructtion of fuzzy regulator, Kolmogorov theorem and idea of its proof.

Recommended literature:

1. Y. Bengio: Learning Deep Architectures for AI, Foundations and Trends in ML, Vol. 2, No. 1 , 2009, pp. 1-127 ##
2. I. Goodfellow, Y. Bengio and A. Courville: Deep Learning, MIT Press book, 2016, ISBN-13: 978-0262035613
https://www.deeplearningbook.org/ ##
3. M. H. Hassoun: Fundamentals of artificial neural networks. MIT Press, Cambridge, 1995. ##
4. J. Hertz, A. Krogh, R.G. Palmer: Introduction to the theory of neural computation, Addison-Wesley, 1991. ##
5. V. Kvasnička a kol.: Úvod do teórie neurónových sietí, IRIS, Bratislava, 1997. ##
6. P. Sinčák, G. Andrejková: Neurónové siete. I. diel: Dopredné siete, II. diel: Rekurentné a modulárne siete, Košice, 1997. ##
7. J. Šíma, R. Neruda: Teoretické otázky neuronových sití, Matfyzpress, MFF UK, Praha, 1996. ##
8. F. Scarselli, M. Gori, Ah Ch. Tsoi, M. Hagenbuchner, and G. Monfardini: The Graph Neural Network Model. IEEE TRANSACTIONS ON NEURAL NETWORKS, VOL. 20, NO. 1, JANUARY 2009 ##

Course language:
Slovak or English

Notes:
For ERASMUS students:
It is necessary to know a model of artificial neurons, its computation and its setting, layered neural networks and backpropagation training algorithm.

Course assessment
Total number of assessed students: 257

A	B	C	D	E	FX
20.23	16.34	23.35	18.68	17.12	4.28

Provides: doc. RNDr. Ľubomír Antoni, PhD., doc. RNDr. Gabriela Andrejková, CSc.

Date of last modification: 20.09.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ NSQL/17	**Course name:** NoSQL databases
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 1 / 1 **Per study period:** 14 / 14 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 2., 4.	
Course level: II.	
Prerequisities:	
Conditions for course completion: Conditions for continuous evaulation: Active attendance at seminars. Conditions for the final evaluation: Implementation and defense of final project.	
Learning outcomes: Know properties of different kinds of NoSQL databases, have an practical experience with given NoSQL databases (Redis, Cassandra, Neo4j, Mongo DB) from program code. Gain skills to identify the appropriate kind of NoSQL database for given purpose.	
Brief outline of the course: 1. Big data, types of NoSQL databases. 2. Data representation formats 3. Key-value databases. 4. Column-oriented databases. 5. Graph databases. 6. Document-oriented databases.	
Recommended literature: 1.HARRISON G.: Next Generation Databases: NoSQL, NewSQL, and Big Data. Apress, 2015. ISBN 978-1-4842-1330-8. 2. HILLS T.: NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and Software. Technics Publications, 2016. ISBN 978-1-6346-2109-0	
Course language: Slovak or English	
Notes: Content prerequisities: programming at PAZ1c level - unrestanding of storage layer principles, besics of relationa databases (SQL language)	

Course assessment
Total number of assessed students: 26

A	B	C	D	E	FX
46.15	15.38	26.92	7.69	3.85	0.0

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 04.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NOT1a/03	**Course name:** Nontraditional Optimization Techniques I

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Oral examination (50%), results and quality of the
personal presentation of the projects (50%).
Monitoring progress in solving applied projects. From given set of problems, the student must pick 1 to 3 projects and develop functioning implementation of the solution in form of computer program. In case of more challenging problems, collaborative work of students is acceptable, but each student must be able to present her/his individual contribution.

Learning outcomes:
To familiarize students with biologically and physically inspired optimization, simulation and prediction techniques. To expand students' creativity and programming skills by applying heuristic techniques in solving applied problems.
Upon successful completion of course, student shall possess knowledge about most typical non-traditional optimization techniques, as well as practical experience of solving concrete problems.

Brief outline of the course:
1. Fundamentals terms and definitions of optimization theory. Physical laws as optimization tasks. Variational principle.
2. Model optimization problems. Basic types of objective functions. Classification of optimization methods. Computational scaling of optimization methods. Big O notation. Parallelization, Metcalf's law, Amdahl's bottleneck.
3. Exhaustive search, Gradient-based optimization techniques.
4. Evolutionary algorithms. Canonical Genetic algorithm. Genetic algorithms as Markov processes. Statistical Mechanics description of Genetic Algorithms.
5. Monte Carlo simulation and simulated annealing. Metropolis algorithm and statistics of sampling in solution space.
6. Swarm optimization. Ant algorithms.
7. Cellular Automata and their applications in simulations of complex systems.
8. data structures and representation of solution space and optimization problems. Compression of information and symmetry. Manifolds.
9. Generators. grammars and languages. Genetic programming. AST and operations on AST representation of programs.

10. Fractals. Lindenmayer systems. Life-like and agent-based models.
11. Evolutionary games. Evolution of cooperation.
12. Fundamentals of Neural Networks. Stochastic gradient optimization.

Recommended literature:

Hartmann, A. K., Rieger, H., Optimization Algorithms in Physics, Wiley, 2002
Reeves, C. R., Rowe, J. E., Genetic Algorithms: Principles and perspectives, Kluwer, 2003
Mitchell, M., Complexity. A Guided Tour, Oxford University Press, 2009
Solé, R. V., Phase Transitions, Princeton University Press, 2011
Ilachinski, A., Cellular Automata. A Discrete universe, World Scientific, 2002
Haykin, S., Neural Networks. A Comprehensive Foundation, Prentice-Hall, 1999
Actual literature and data related to problem sets

Course language:

English language is essential for students as "lingua franca" for the latest advancements and applications of optimization techniques.

Notes:

The subject is taught using direct contact form. Should the epidemiological situation (or other relevant circumstances) mandate, the distant form will be used, preferentially using MS Teams learning environment.

Course assessment

Total number of assessed students: 99

A	B	C	D	E	FX
69.7	18.18	7.07	2.02	3.03	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 22.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NOT1b/03	**Course name:** Nontraditional Optimization Techniques II

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 4.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Presentation of the project in written form. Oral exam and discussion of the presented project. Should corona-virus quarantine persist, written report and answer to posed questions suffice.

Learning outcomes:
By using examples from the biology to learn applications of optimization techniques on study and interpretation of complex systems. Introduction to new paradigms in the area of systems biology, including parasite/host coevolution.

Brief outline of the course:
Complex systems, emergent behavior. Evolutionary theory and memetics. Application of optimization techniques on complex systems. Application of methods /genetic algorithms, simulated annealing, taboo search/ on selected problems of biomolecular simulations. Molecular dynamics, protein folding. Population dynamics, metabolic networks and complexity in bioinformatics.

Recommended literature:
The actual scientific papers.

Course language:

Notes:

Course assessment
Total number of assessed students: 61

A	B	C	D	E	FX
86.89	6.56	4.92	1.64	0.0	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 08.09.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PDB1/15	**Course name:** Organization and data processing

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Conditions for the final evaluation:
final test

Learning outcomes:
To understand the principles of database management systems. To be able to use the knowledge when solving optimization problems over big data and managing parallel and distributed databases.

Brief outline of the course:
1. Data representation, disk and file organization,
2. Tree-based indexing methods B+tree, R-tree,
3. Working with low-level classes to working with files
4. Creation of clustered and unclustered indexes
5. Hash-based indexing methods, external sorting,
6. Enumeration of relational operators, query optimization,
7. Case study: practical DB optimalization
8. Transaction management,
9. Crash recovery
10. Parallel databases, evaluation of relational operators in parallel databases
11. Distributed databases, evaluation of relational operators in distributed databases, database security and data consistency, recovery management in distributed database, distributed trasactions, distribution of table replicas

Recommended literature:
1. R. RAMAKRISHNAN, J. GEHRKE: Database Management Systems, McGraw Hill Higher Education, 2003
2. A. SILBERSCHATZ, H. F. KORTH, S. SUDARSHAN: Database system concepts, McGraw Hill Higher Education, 2006

Course language:
Slovak or English

Notes:
Content prerequisities: SQL language (DBS1a), basics of programming (PAZ1a)

Course assessment
Total number of assessed students: 138

A	B	C	D	E	FX
28.99	19.57	14.49	10.87	23.91	2.17

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 04.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PDS1/21	**Course name:** Parallel and distributed systems

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2.

Course level: II., N

Prerequisities:

Conditions for course completion:
Home assignments, class project from tutorials, midterm written exam. Final written and oral exam.

Learning outcomes:
Understand the principles, basic problems and algorithms of parallel programming. Be able to implement synchronization procedures and manage and use interprocess communication. Master the basics of GPU programming. Understand the differences between parallel and distributed computational models. Master basic distributed algorithms and know how to implement them. Understand the problems of creating a distributed system environment and know how to solve them. Be able to use distributed environments in practical applications.

Brief outline of the course:
Parallel architectures, parallel computational model, access to shared memory. Basic algorithms, scaling, optimality. Effective methods of parallel search and sorting. Working in a GPU environment. Distributed computational model, communication protocols, characteristics of distributed systems. Intercomputer communication, distributed synchronization algorithms, transactions, termination and deadlock detection. Consistency issues with distributed memory sharing. Distributed application environment. Reliable calculations in an environment with errors.

Recommended literature:
1. J. JáJá: An Introduction to Parallel Algorithms, Addison-Wesley, 1992, ISBN 0-201-54856-9
2. P. Sanders, K. Mehlhorn, M. Dietzfelbinger, R. Dementiev: Sequential and Parallel Algorithms and Data Structures, Springer, 2019
3. Sukumar Ghosh: Distributed Systems and Algorithms (Second Edition), CRC Press 2014
4. M. Raynal: Distributed Algorithms for Message-Passing Systems, Springer, 2013
5. Gerard Tel: Introduction to Distributed Algorithms, Cambridge University Press, 2001

Course language:
Slovak or English

Notes:
Content prerequisities: basic of concurrent programming, basic of operating system principles

Course assessment
Total number of assessed students: 48

A	B	C	D	E	FX
18.75	6.25	16.67	18.75	25.0	14.58

Provides: doc. RNDr. Jozef Jirásek, PhD., RNDr. Rastislav Krivoš-Belluš, PhD., Bc. Marián Dvorský, RNDr. Ladislav Mikeš, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KF/ FILA/22	**Course name:** Philosophical Antropology

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 0

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

Provides: doc. PhDr. Kristína Bosáková, PhD.

Date of last modification: 01.02.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PDSI1/15	**Course name:** Pro-seminar to diploma thesis in informatics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Evaluation of the student's paper with a focus on the issue of the diploma thesis.
Evaluation of the achieved results of the student during the semester on the diploma thesis on the basis of his / her report and the created diploma website.

Learning outcomes:
To inform students about areas of informatics they are suitable to work in diploma theses. In the end of semester students have to prepared themes of diploma theses, goals and recommended study literature.

Brief outline of the course:
The seminar is oriented to problems prospective to preparations of Diploma theses.

Recommended literature:
1. MEŠKO, D., KATUŠČÁK, D. Akademická príručka. 1. vyd. Vydavateľstvo Osveta : Martin, 2004. 316 s. ISBN 80-8063-150-6
2. ISO 690: 1987 Documentation - Bibliographic references. Content, form and structure.
3. ISO 2145: 1978 Documentation - Numbering of divisions and subdivisions in written documents.
4. Eco, U.: Jak napsat diplomovou práci, z taliančiny Come si fa una tesi di laures, Milano, 1977, Olomouc, Votobiax.
5. Professional and scientific literature related to the diploma thesis according to the recommendation of the thesis supervisor.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 108

abs	n
98.15	1.85

Provides:
Date of last modification: 08.01.2022
Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/RPBI/20	**Course name:** Resolving computer security incidents

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

Number of ECTS credits: 3

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

Course level: I., II.

Prerequisities:

Conditions for course completion:
The condition for passing the course are homeworks (50% of the total number of points) and the final practical task (50% of the total number of points).

Learning outcomes:
The result of the education is an understanding of the basic approaches to solving computer security incidents from procedural and legal requirements to ways of identifying the security incident and the method of its technical solution.

Brief outline of the course:
1. Introduction to computer security incident hadling and response, 2. The process of handling and response to computer security incidents and computer security incident response teams, 3. Legal aspects of the computer security incidents handling, 4. Preparing for the security incidents handling and the first response, 5. Introduction to digital forensic analysis, 6. Incident handling and response to computer security incidents in the field of malware, 7. Incident handling and responseto computer security incidents in the field of email communication, 8. Incident handling and response to network security incidents I., 9. Incident handling and response to network security incidents II., 10. Incident handling and responseto computer security incidents in the field of web applications I., 11. Incident handling and responseto computer security incidents in the field of web applications II., 12. Incident handling and response to cloud security incidents, 13. Incident handling and responseto cyber security incidents in the field of insiders, 14. Final assignment.

Recommended literature:
1. MURDOCH, Don. Blue Team Handbook: Incident Response Edition: A condensed field guide for the Cyber Security Incident Responder. South Carolina, United States: CreateSpace Independent Publishing Platform, 2014. ISBN 978-1500734756, 2. ANSON, Steve. Applied Incident Response. New York, United States: Wiley, 2020. ISBN 978-1119560265, 3. ROBERTS, Scott. Intelligence-Driven Incident Response: Outwitting the Adversary. Sebastopol, California, United States: O'Reilly Media, 2017. ISBN 978-1491934944.

Course language:
Slovak or English

Notes:

Content prerequisites: basic knowledge in the field of information security, basics of working with the Linux operating system, basic knowledge of computer networks.

Course assessment
Total number of assessed students: 17

A	B	C	D	E	FX
58.82	23.53	11.76	5.88	0.0	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Eva Marková

Date of last modification: 26.09.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PPU1a/15	**Course name:** Running practice

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Conditions for continuous evaluation:
Active participation in the selected type of internship based on the instructions given by the internship supervisor.
Conditions for the final evaluation:
Evaluation of the student's approach to the internship and the work performed in the internship by the internship supervisor.

Learning outcomes:
Experiences with the implementation of a selected type of internship.

Brief outline of the course:
The exact content of the internship is specified by the internship supervisor. Students choose from a menu of topics presented by the course administrator. Typical topics of practice are:
1. assistance in the realization of exercises for yunger studnets, providing feedback to students on submitted homeworks
2. assistance in the installation and maintenance of computer and network infrastructure at UPJŠ
3. realizations of courses for working with specific software
4. creation of overviews from freely available sources

Recommended literature:
The study or technical literature is determined individually depending on the focus of the internship by the internship supervisor.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 205

abs	n
97.56	2.44

Provides: Ing. Miron Kuzma, PhD.
Date of last modification: 23.11.2021
Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PPU1b/15	**Course name:** Running practice

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Conditions for continuous evaluation:
Active participation in the selected type of internship based on the instructions given by the internship supervisor.
Conditions for the final evaluation:
Evaluation of the student's approach to the internship and the work performed in the internship by the internship supervisor.

Learning outcomes:
Experiences with the implementation of a selected type of internship.

Brief outline of the course:
The exact content of the internship is specified by the internship supervisor. Students choose from a menu of topics presented by the course administrator. Typical topics of practice are:
1. assistance in the realization of exercises for yunger studnets, providing feedback to students on submitted homeworks
2. assistance in the installation and maintenance of computer and network infrastructure at UPJŠ
3. realizations of courses for working with specific software
4. creation of overviews from freely available sources

Recommended literature:
The study or technical literature is determined individually depending on the focus of the internship by the internship supervisor.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 138

abs	n
99.28	0.72

Provides: Ing. Miron Kuzma, PhD.
Date of last modification: 23.11.2021
Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ VHSP/17	**Course name:** SAP HANA environment computations
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: II.	
Prerequisities:	
Conditions for course completion: Conditions for continuous evaluation: Active participation in problem solving tasks during classes. Conditions for final evaluation: Evaluation of student's approach and creativity on solutions of given tasks.	
Learning outcomes: Experience with basic SAP HANA ecosystem, experience with system's modules and SAP UI5 application development for SAP HANA.	
Brief outline of the course: 1. Introduction to in memory computation 2. Comparison of in-memory and traditional SQL 3. HANA basics - administration, monitoring, data persistency, backup, update 4. HANA SQL language 5. HANA Eclipse Studio 6. Procedures, functions, scripts 7. Spatial data 8. HANA XS applications 9. advanced HANA XS applications 10. Streaming data analytics - notifications, patterns 11. Streaming data analytics - client - server application 12. Predictive analytics - machine learning 13. Predictive analytics - HANA libraries and tools	
Recommended literature: The SAP HANA reference guide is the main study and technical literature, it is an online source. There may occur some other refence guides as well, depending of the type of the particular task.	
Course language: Communication: Slovak, English Literature: English	
Notes:	

Course assessment Total number of assessed students: 15	
abs	n
100.0	0.0
Provides: Ing. Miron Kuzma, PhD.	
Date of last modification: 24.11.2021	
Approved: prof. RNDr. Stanislav Krajči, PhD.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ ÚTVŠ/CM/13	**Course name:** Seaside Aerobic Exercise

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: I., II.

Prerequisities:

Conditions for course completion:
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- aerobics, water exercise, yoga, Pilates and others

Learning outcomes:
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:
- perform basic aerobics steps and basics of health exercises,
- conduct verbal and non-verbal communication with clients during exercise,
- organise and manage the process of physical recreation in leisure time

Brief outline of the course:
Brief outline of the course:
1. Basic aerobics – low impact aerobics, high impact aerobics, basic steps and cuing
2. Basics of aqua fitness
3. Basics of Pilates
4. Health exercises
5. Bodyweight exercises
6. Swimming
7. Relaxing yoga exercises
8. Power yoga
9. Yoga relaxation
10. Final assessment

Students can engage in different sport activities offered by the sea resort – swimming, rafting, volleyball, football, table tennis, tennis and other water sports in particular.

Recommended literature:
1. BUZKOVÁ, K. 2006. Fitness jóga. Praha: Grada. 167 s.

2. ČECHOVSKÁ, I., MILEROVÁ, H., NOVOTNÁ, V. Aqua-fitness. Praha: Grada. 136 s.
3. EVANS, M ., HUDSON, J., TUCKER, P. 2001. Umění harmonie: meditace, jóga, tai-či, strečink. 192 s.
4. JARKOVSKÁ, H., JARKOVSKÁ, M. 2005. Posilováni s vlastním tělem 417 krát jinak. Praha: Grada. 209 s.
5. KOVAŘÍKOVÁ, K. 2017. Aerobik a fitness. Karolium, 130 s.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 54

abs	n
11.11	88.89

Provides: Mgr. Agata Dorota Horbacz, PhD.

Date of last modification: 29.03.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ OPS1/15	**Course name:** Security of computer networks

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

Number of ECTS credits: 5

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

Course level: II.

Prerequisities:

Conditions for course completion:
Homeworks, active participation in laboratory exercises, midterm test.
Final written exam, oral examination.

Learning outcomes:
Understand the importance and possibilities of information systems security, system and network security threats. To be able to detect security threats in the implementation of the Internet, to be able to configure and use security gateways and proxy servers. Understand the principle and risks of SSL and IPSec security protocols and know how to use them.

Brief outline of the course:
1. IS security principles, assets, threats, risks, attacks, the role of network and communication security, security objectives, functions and mechanisms.
2. Data transfer methods, technological and theoretical limits, transmission media, vulnerabilities and security threats.
3. Security threats of data transmission at the communication level of the communication model, data flow management in local networks, switching, STP, virtualization, MACsec, multiprotocol switching.
4. Security specifics of wireless transmission, WLAN networks, authentication mechanisms for WDS, data transmissions via mobile networks (GSM, LTE).
5. Remote access to the local network, EAP authentication, RADIUS protocol, trust management, certificate usage, certification process, certification authority tasks.
6. Security of IPv4 and IPv6 network protocols, possible attacks and protection, IPsec protocol, security associations and policies, exchange of cryptographic information.
7. Vulnerabilities of TCP and UDP transport protocols, TLS protocol, data security in TLS sessions, tunneling, VPN.
8. Security aspects of Internet application layer protocols, telnet, FTP, use of SSH protocol.
9. HTTP vulnerabilities, CSP, XSS content protection, code embedding, browser and server level protection, current implementation attacks.
10. Secure e-mail, MIME and S/MIME extensions, digitally signed and encrypted messages, security of mail servers, filtering of malicious content.
11. Internet, DNS and DNSSEC network security, DHCP, SNMPv3.

12. Connection filtering, proxy servers, hidden networking, NAT, NPT.
13. Security gate architecture, demilitarized zone, filtering rules, intrusion detection and prediction at the security gate level.

Recommended literature:

1. Paul C. van Oorschot: Computer Security and the Internet: Tools and Jewels, Springer, 2020
2. W. Stallings: Cryptography & Network Security, Pearson Education, 7th edition, 2017
3. L. Dostálek: Velký průvodce protokoly TCP/IP - bezpečnost, Computer Press 2003

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 23

A	B	C	D	E	FX
30.43	17.39	13.04	13.04	21.74	4.35

Provides: RNDr. Rastislav Krivoš-Belluš, PhD., doc. RNDr. Jozef Jirásek, PhD.

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ BPD1/15	**Course name:** Security of computer systems and data

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

Number of ECTS credits: 5

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

Course level: I., II.

Prerequisities:

Conditions for course completion:
Homeworks, active participation in laboratory exercises.
Final practical test, oral examination.

Learning outcomes:
Familiarize with the concepts, methods, and means to ensure the confidentiality, integrity, and availability of computer systems assets. To control in more detail the issues of access control to computer system resources, operating system security, program security, database systems security. Gain the ability to create security models, use cryptographic methods to ensure security, know how to evaluate system and communication security. By completing the course the student will gain the knowledge necessary in the design of secure computer and information systems, risk analysis and security audit of information systems.

Brief outline of the course:
1. Computer security concepts, information security, security policies for its individual components.
2. User authentication principles, password generation and management, multifactor authentication, vulnerabilities.
3. Access control models, access matrices, attribute models, multilevel models, reference monitors, access monitoring and audit.
4. System security. System installation, update management, service configuration, resource management and monitoring, user administration, remote access, virtualization, hardening.
5. Equipment for digital data storage, coding, durability, confidentiality, integrity, availability, replication, archiving, disposal.
6. System startup (BIOS, UEFI), disk data organization, file systems and their vulnerabilities.
7. Management and monitoring of processes, operating system services, executable files and their structure, metadata.
8. Intel and ARM processor architecture, assembler, memory access organization, segmentation and paging support, process execution support.
9. Malicious software, advanced persistence threat. Methods of system attacks, static analysis of potentially malicious software, countermeasures.
10. Dynamic analysis of malicious software, basics of disassembly techniques.

11. Mechanisms of attacks at the level of application programs, exceeding the allocated resources, code insertion, social engineering.
12. Vulnerabilities of database systems, security of requirements, inference channels, problems of cloud implementations, archiving and secure data deletion.
13. Secure software development, defensive programming, input validation, formal verification, OWASP principles for web application development.

Recommended literature:

1. STALLINGS, W.: Computer Security: Principles and Practice, 4.ed., Pearson, 2017, ISBN 978-0134794105
2. PFLEEGER, CH.,P.: Security in Computing. 4th ed. Prentice-Hall International, Inc., 2006, ISBN: 0-13-2390779
3. GOLLMANN, D.: Computer Security. John Wiley & Sons, 2011, ISBN: 0-470-741155.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 66

A	B	C	D	E	FX
21.21	18.18	18.18	21.21	21.21	0.0

Provides: doc. RNDr. Jozef Jirásek, PhD., RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KF/ FIVYC/22	**Course name:** Selected Topics in Philosophy of Education (General Introduction)

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 2

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

Provides: PhDr. Dušan Hruška, PhD.

Date of last modification: 27.04.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ VKM/10	**Course name:** Selected topics in mathematics

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Awarded according to tests during semester (40 points), written exam (20 points), oral exam (40 points).

Learning outcomes:
Students learn the fundamentals of probability theory, random processes, algebra of polynomials, linear and integer optimalization. The emphasis is on practical applications.

Brief outline of the course:
Probability: classical definition, conditional probability, characteristics of random variables, geometrical probability.
Random processes, Markov chains.
Polynomials over a field. Decomposition into irreducible factors. Roots of polynomials.
Formulation of linear and integer programs. Graphic solution. Simplex method. Duality. Algorithm for integer programming.

Recommended literature:
G. Birkhoff, S. MacLane: Prehľad modernej algebry, Alfa Bratislava, 1979
T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985
Plesník, Dupáčová, Vlach: Lineárne programovanie, Alfa, Bratislava 1990
Riečan a kol.:Pravdepodobnosť a matematická štatistika, Alfa, Bratislava, 1984
Skřivánková V.: Pravdepodobnosť v príkladoch, UPJŠ, Košice, 2006

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 100

A	B	C	D	E	FX
15.0	20.0	18.0	24.0	21.0	2.0

Provides: doc. RNDr. Miroslav Ploščica, CSc., doc. RNDr. Roman Soták, PhD.

Date of last modification: 08.02.2022
Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ SWB/15	**Course name:** Semantic web

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

Number of ECTS credits: 4

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

Course level: II.

Prerequisities:

Conditions for course completion:
Conditions for the final evaluation:
presentation of selected SW library or tool of semantic web in from of seminar for schoolmates

Learning outcomes:
Understanding of semantic web languages RDF, RDFS, OWL, ability to use them in practical semantic web applications, experience with ontology modelling and communication with ontology databases.

Brief outline of the course:
1. Semantic web - motivation, problems, visions.
2. Structured web documents, XML, syntax, programming models DOM, SAX, StAX, namespaces in XML, XPath language, XQuery language. Examples of processing XML in Java.
3. Semantic web modelling languages: RDF, RDFS, OWL
4. Semantic web query language SPARQL, database RDF4J
5. Description logic
6. Creation of ontology in modelling tool Protege, reasoning
7. Topic Maps language, modelling in tool Ontopia
8. Jena linbrary
9. DBPedia, Google knowledge graph and thair usage in program

Recommended literature:
[1]ANTONIOU, Grigoris a Frank van HARMELEN. A semantic web primer. Cambridge: MIT Press, c2008. ISBN 978-0-262-01242-3.
[2] BAADER, Franz. The Description Logic Handbook. Theory, Implementation and Applications. 2nd edition, Cambridge University Press, 2010. ISBN 978-0-521150118
[3] Project RDF4J. Available online: <http://www.openrdf.org/>
[4] Project Protege. Available online: <http://protege.stanford.edu/>
[5] Project Jena. Available online: <http://jena.sourceforge.net/>
[6] SPARQL langugae documantation. Available online: <http://www.w3.org/TR/rdf-sparql-query/>

Course language:
Slovak or english

Notes:
Content prerequisities: basic programming in Java (PAZ1a), Foundations of first order logic (SLO1a), basics of databases (DBS1a)

Course assessment
Total number of assessed students: 50

A	B	C	D	E	FX
72.0	8.0	10.0	4.0	2.0	4.0

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 17.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SPS1/15	**Course name:** Seminar in network programming

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

Number of ECTS credits: 3

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

Course level: I., II.

Prerequisities:

Conditions for course completion:

Learning outcomes:
To render current technologies of programing in network distributed environment.

Brief outline of the course:
Basics of programming the client-server applications, iterative and concurrent servers, Remote Procedure Calls. Server-side programming, CGI, PHP, basics of Perl and Python. Script languages, ASP, JSP, Component Object Model, Corba, database connection's interfaces. Document Object Model, XML, XSL, dynamic extensions of HTML.
Advanced level of programming is expected.

Recommended literature:
Internet sources and specifications.

Course language:

Notes:

Course assessment
Total number of assessed students: 96

A	B	C	D	E	FX
65.63	20.83	11.46	1.04	1.04	0.0

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SGV1/16	**Course name:** Seminar on computer graphics and vision

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:
Seminar is connecte to the lecture UGR Introduction to computer graphics. In seminar form students presents actual theoretical and implementation problems. Main goal in interest is oriented to quick algorithms of computer graphics, geometric modelling and realistic drawing of scenes.
Knowledge from the lecture UGR and good programmers experience are supposed.

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 47

A	B	C	D	E	FX
68.09	17.02	12.77	2.13	0.0	0.0

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SDI1a/15	**Course name:** Seminar to diploma theses in informatics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚINF/PDSI1/15

Conditions for course completion:
Presentation of the analysis of the assignment and the proposal of the solution of the diploma thesis tasks, editing of the web page, written elaboration of the analysis and design of the solution.

Learning outcomes:
Monitoring and public presentation of work done so fare on thesis preparation

Brief outline of the course:
The seminar serves for control, public presentation and defense of partial results at DP. In order to be awarded the credits, it is necessary to successfully complete the presentation of the analysis of the assignment and the achieved results, including the proposal of specific steps of the further solution procedure, update the presentation of the diploma thesis on the network and prepare a written analysis and proposal for solving the assigned problem in the range of 15-20 pages.

Recommended literature:
According to the topic of diploma thesis.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 196

abs	n
95.41	4.59

Provides:

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SDI1b/15	**Course name:** Seminar to diploma theses in informatics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities: ÚINF/SDI1a/15

Conditions for course completion:
Presentation of achieved results on the diploma thesis, web page modification, written processing of results.

Learning outcomes:
Monitoring and public presentation of work done so fare on thesis preparation

Brief outline of the course:
Every thesis has a compulsory theoretical part and may also contain a software part. To gain recognition, the following is necessary: a detailed compilation of studied literature (a minimum of thirty pages) and at least twenty pages of text containing the candidate's own views of the problem area, possible research goals, own results are welcome (if the thesis is purely theoretical, this will be judged more strictly). For the SW part: a tested implementation (must conform to user requirements, help and user friendly user interface not necessary at this stage) and access to source texts.
For both parts there will be an oral presentation and discussion.

Recommended literature:
According to the topic of diploma thesis

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 181

abs	n
99.45	0.55

Provides:

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SDI1c/15	**Course name:** Seminar to diploma theses in informatics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 4.

Course level: II.

Prerequisities: ÚINF/SDI1b/15

Conditions for course completion:
Presentation of the achieved results of the diploma thesis with a discussion. Final editing of the web page.

Learning outcomes:
Monitoring and public presentation of work done so fare on thesis preparation

Brief outline of the course:
The seminar serves for control, public presentation and defense of DP results. In order to be awarded the credits, it is necessary to complete a public presentation of the work associated with the discussion, together with the final presentation of the presentation on the Internet.

Recommended literature:
According to the topic of diploma thesis.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 162

abs	n
100.0	0.0

Provides:

Date of last modification: 08.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PRJm1a/15	**Course name:** Software project

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Activity in exercises, elaboration of home assignments. Presentation of the results achieved in solving a specific problem. Uploading a software work.

Learning outcomes:
Learn how to work on a larger software part at all stages of its life cycle. Be able to analyze and explicitly express user requirements, precisely specify the task, design a solution and evaluate alternatives. Implement and test an effective and correctly designed solution. Learn to keep detailed documentation and present the results of the work in writing and in public. Learn to work together in a development team, share work effectively and exchange ideas.

Brief outline of the course:
1. Introduction to the Software Project, team building.
2. Presentation of projects and assignment of Projects to individual teams.
3. Data storage, working with storage
4. Command Line commands to work with the repository
5. Creating versions
6. Presentation of the current state of the projects
7. Presentation of the current state of the projects
8. Merging of individual branches
9. Presentation of new technologies from the project
10. Presentation of new technologies from the project
11. Presentation of the final project.
12. Presentation of the final project.

Recommended literature:
1. https://www.udemy.com/course/ Git & GitHub - The Complete Git & GitHub
2. https://www.jenkins.io/doc/
3. Study literature tied to the selected project (according to the client's recommendation)

Course language:
Slovak or English

Notes:

Content prerequisities: advanced programming skills.

Course assessment
Total number of assessed students: 42

A	B	C	D	E	FX
73.81	7.14	2.38	2.38	9.52	4.76

Provides: RNDr. Róbert Novotný, PhD., RNDr. Peter Gurský, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PRJm1b/15	**Course name:** Sofware project

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Presentation of the results achieved in solving a specific problem. Uploading a software work. Preparation of materials for the promotion of the final work.

Learning outcomes:
Learn how to work on a larger software part at all stages of its life cycle. Be able to analyze and explicitly express user requirements, precisely specify the task, design a solution and evaluate alternatives. Implement and test an effective and correctly designed solution. Learn to keep detailed documentation and present the results of the work in writing and in public. Learn to work together in a development team, share work effectively and exchange ideas.

Brief outline of the course:
1. Introduction to the Software Project, team building.
2. Presentation of projects and assignment of Projects to individual teams.
3. CI / CD Pipeline
4. JUnit Tests
5. Selenium Tests
6. Presentation of the current state of the projects
7. Presentation of the current state of the projects
8. Stress tests
9. Presentation of new technologies from the project
10. Presentation of new technologies from the project
11. Presentation of the final project.
12. Presentation of the final project.

Recommended literature:
1. https://www.udemy.com/course/ Git & GitHub - The Complete Git & GitHub
2. https://www.jenkins.io/doc/
3. Study literature tied to the selected project (according to the client's recommendation)

Course language:
Slovak or English

Notes:

content prerequisities: advanced programming skills

Course assessment
Total number of assessed students: 17

A	B	C	D	E	FX
82.35	5.88	5.88	0.0	0.0	5.88

Provides: RNDr. Róbert Novotný, PhD., RNDr. Peter Gurský, PhD.

Date of last modification: 23.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SSDa/20	**Course name:** Specialized seminar to diploma thesis

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Presentation of scientific papers and software solutions in the selected field of computer science.
Active participation in discussions about possible solutions to selected problems.

Learning outcomes:
Student train the ability to study and present the principles and use of new software solutions to colleagues or to study and present the results of scientific results published in journals and conference papers.

Brief outline of the course:
Presentation of scientific papers from a selected field of informatics.
Practical presentation of current software solutions (libraries, frameworks) that are not included in study programs.
Discussions on possible solutions to selected problems in computer science.
The schedule of presentations will be published after the first meeting on the subject's website or other agreed location.

Recommended literature:
1. Scientific books and papers related to the selected field of computer science.
2. Book and online resources describing principles and use of selected software solutions

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 29

abs	n
100.0	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Juraj Šebej, PhD., RNDr. Peter Gurský, PhD., doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 17.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SSDb/20	**Course name:** Specialized seminar to diploma thesis

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Presentation of scientific papers and software solutions in the selected field of computer science.
Active participation in discussions about possible solutions to selected problems.

Learning outcomes:
Student train the ability to study and present the principles and use of new software solutions to colleagues or to study and present the results of scientific results published in journals and conference papers.

Brief outline of the course:
Presentation of scientific papers from a selected field of informatics.
Practical presentation of current software solutions (libraries, frameworks) that are not included in study programs.
Discussions on possible solutions to selected problems in computer science.
The schedule of presentations will be published after the first meeting on the subject's website or other agreed location.

Recommended literature:
1. Scientific books and papers related to the selected field of computer science.
2. Book and online resources describing principles and use of selected software solutions

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 34

abs	n
88.24	11.76

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Juraj Šebej, PhD., RNDr. Peter Gurský, PhD., doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 17.11.2021

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVa/11	**Course name:** Sports Activities I.

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 1.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Min. 80% of active participation in classes.

Learning outcomes:
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.

Brief outline of the course:
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.

Recommended literature:
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
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: 15193

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
86.05	0.07	0.0	0.0	0.0	0.05	8.69	5.15

Provides: Mgr. Patrik Berta, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Marcel Čurgali, Mgr. Alena Buková, PhD., doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD.

Date of last modification: 07.02.2024

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVb/11	**Course name:** Sports Activities II.

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: I., II.

Prerequisities:

Conditions for course completion:
active participation in classes - min. 80%.

Learning outcomes:
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.

Brief outline of the course:
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.

Recommended literature:
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
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: 13318

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
84.37	0.51	0.02	0.0	0.0	0.05	10.78	4.28

Provides: Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Marcel Čurgali, Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Alena Buková, PhD., doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD.

Date of last modification: 07.02.2024

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVc/11	**Course name:** Sports Activities III.

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: I., II.

Prerequisities:

Conditions for course completion:
min. 80% of active participation in classes

Learning outcomes:
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.

Brief outline of the course:
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.

Recommended literature:
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
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: 9100

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
88.37	0.07	0.01	0.0	0.0	0.02	4.46	7.07

Provides: Mgr. Marcel Čurgali, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Alena Buková, PhD., doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD.

Date of last modification: 07.02.2024

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVd/11	**Course name:** Sports Activities IV.

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 4.

Course level: I., II.

Prerequisities:

Conditions for course completion:
min. 80% of active participation in classes

Learning outcomes:
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.

Brief outline of the course:
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.

Recommended literature:
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
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: 5671

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
82.81	0.28	0.04	0.0	0.0	0.0	7.97	8.9

Provides: Mgr. Marcel Čurgali, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Alena Buková, PhD., doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD.

Date of last modification: 07.02.2024

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ SVK1/15	**Course name:** Student scientific conference

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 4.

Course level: I., II.

Prerequisities:

Conditions for course completion:
It is required to be registered for the participation on the Student Scientific Conference (ŠVK) in accordance to the Statute of the Student Scientific Conference at PF UPJŠ and the specific conditions for participation in a given year, which are announced by the dean of the faculty. Within one year of the ŠVK, a student or a research team can register in one track only. It is also possible to apply with a written work that is an integral part of a bachelor's or master's thesis or a result of a student support program. The written work at ŠVK is the result of the student's own work or the work of the research team. 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 process of supervision and in the process of work presentation. Failure to do so is reason for disciplinary action. The condition for the evaluation is a successful presentation and defense of the work in the relevant track headed by a commission appointed by the dean of the faculty. The commission decides on the eligibility of credits and states its decision in the memorandum of the ŠVK.

Learning outcomes:
The student demonstrates mastery of extended theory and professional terminology of the field of study, acquisition of knowledge, skills and competences, the ability to apply them creatively in solving selected field problems, ability to present the results using appropriate presentation methods and tools and ability to actively participate in a professional discussion.

Brief outline of the course:
1. Analysis of the state of the art in the field.
2. Design and implementation of a solution to the researched problem.
3. Evaluation of achieved results.
4. Preparation of work annotation.
5. Processing the written work.
6. Preparation of results presentation.
7. Presentation and defense of the obtained results.

Recommended literature:

The recommended literature is specified individually by the student or research team in agreement with the consultant or the supervisor.

Course language:
Slovak or english

Notes:

Course assessment
Total number of assessed students: 29

abs	n
100.0	0.0

Provides:

Date of last modification: 25.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ LKSp/13	**Course name:** Summer Course-Rafting of TISA River

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: I., II.

Prerequisities:

Conditions for course completion:
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

Learning outcomes:
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.

Brief outline of the course:
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

Recommended literature:
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: https://ulozto.sk/tamhle/UkyxQ2lYF8qh/name/Nahrane-7-5-2021-v-14-46-39#!ZGDjBGR2AQtkAzVkAzLkLJWuLwWxZ2ukBRLjnGqSomICMmOyZN==

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 209

abs	n
37.32	62.68

Provides: Mgr. Dávid Kaško, PhD.

Date of last modification: 29.03.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ VEP1/21	**Course name:** Verification and testing of programs

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Activity during course, work on tasks/assignments, final evaluation based on collected points

Learning outcomes:
Foundation of software testing principles at the basic level and the importance of its application in practice. The utilization of test automation to streamline the testing process across the software development lifecycle.

Brief outline of the course:
1. Fundamentals of software testing, testing throughout the software development lifecycle, test levels, test types, maintenance testing
2. Static testing techniques, test case design, test techniques, test implementation, test execution
3. Test management, test strategy, defect management, tool support for testing, code review
4. Test automation introduction, purpose of test automation, success factors, test automation strategy, preparing for test automation
5. Generic test automation architecture, test automation solution development, test automation framework
6. Transition from manual tests to automated tests, criteria for automation, test automation pyramid
7. Test automation of Graphical user interface (Web, Desktop, Mobile), various tools overview
8. Web services (REST) test automation, various tools overview
9. Testing and automation in Agile and DevOps, exploratory testing, behavior driven development, test driven development, acceptance test driven development, integration to CICD
10. Non-Functional testing introduction, performance and load testing, security testing, usability testing

Recommended literature:
1. ISTQB CTFL Sylabus, available online <https://www.istqb.org/certification-path-root/foundation-level-2018.html>, <https://castb.org/wp-content/uploads/2020/05/ISTQB_CTFL_Syllabus_SK_2018_3.1-1.pdf>
2. ISTQB ATAE Sylabus, available online < https://www.istqb.org/certification-path-root/test-automation-engineer.html >
3. Myers, G.: The Art of Software Testing, (2011)

4. Lisa Crispin and Janet Gregory: Agile Testing: A Practical Guide for Testers and Agile Teams, 2008
5. Mark Fewster, Dorothy Graham: Software Test Automation: Effective use of test execution tools, 1999
6. Mark Fewster, Dorothy Graham: Experiences of Test Automation: Case Studies of Software Test Automation, 2012
7. Katarina Clokie: A Practical Guid to Testing in DevOps, available online <https://leanpub.com/testingindevops>

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 34

A	B	C	D	E	FX
38.24	20.59	14.71	14.71	11.76	0.0

Provides: Mgr. Maroš Dzuriš

Date of last modification: 31.01.2022

Approved: prof. RNDr. Stanislav Krajči, PhD.