CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ AOS/25	**Course name:** Administration of Operating Systems

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., 4.

Course level: II., N

Prerequisities:

Conditions for course completion:
To complete the course, students must successfully complete a project focused on configuring network services.

Learning outcomes:
The learning outcome is to understand the theoretical and practical background of Windows and Linux operating systems and selected network services.

Brief outline of the course:
1) Linux Operating System Management (basic system tools for troubleshooting, system startup, network configuration),
2) File systems (general overview, RAID, LVM),
3) Container Management (Docker),
4) Web hosting services I (basic concept, APACHE),
5) Web hosting services II (SQL, HTTPS, security, NGINX),
6) File services (SAMBA, NFS, FTP),
7) Virtualization platforms (VMware, Proxmox),
8) Local network Management (routing, DHCP, firewall),
9) Remote device Management Automation (Ansible),
10) VPN, SSH, and Proxy,
11) Windows OS and Windows domain management,
12) Linux kernel,
13) Logging in Linux OS and Windows OS.

Recommended literature:
1) LPIC-1 Exam 102. LPI [online]. Canada: The Linux Professional Institute, 2021 [cited 2021-9-22]. Available from: https://learning.lpi.org/en/learning-materials/102-500/,
2) Linux - Documentation Project [online]. 4. Prague: Computer Press, 2007 [cited 2021-9-22]. Available from: https://i.iinfo.cz/files/root/k/LDP_4.pdf,
3) The LPIC2 Exam Prep [online]. Sue B.V. - Open Sourced, 2021 [cited 2021-9-26]. Available from: https://lpic2book.github.io/src/

Course language:

Slovak or English

Notes:
Content prerequisites: Understanding basic concepts of operating systems, computer networks, and basic knowledge of the Linux shell (e.g., Bash) and PowerShell.
The course is not organized every year.

Course assessment
Total number of assessed students: 55

A	B	C	D	E	FX
70.91	14.55	7.27	0.0	5.45	1.82

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

Date of last modification: 05.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KPO/ ASPI/25	**Course name:** Analysis of Intelligence and Political Information

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: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
The prerequisite for a course grade is active participation in class and obtaining a sufficient number of points for the interim assessment (activity in meetings, interim reports) and the final assessment (final thesis/policy brief). The final grade for the course will be calculated based on the sum of the interim and final assessment scores. The student is allowed a maximum of two absences. In the case of more than two absences, the student does not meet the requirements for successful completion of the course. In the event of any attendance problems, the student shall, on his/her own initiative, contact the instructor with information about his/her absence. Opportunity to earn points toward the grade for activity during class. Final grade: The final grade will be based on a term paper (policy brief) that students will turn in at the end of the semester (max. 20 points; min. 12 points). The seminar paper should be between 10 and 15 pages in length and should meet the formal requirements of an academic thesis. In addition to describing the issue, it will also analyse the content and provide a set of recommendations, with an emphasis on the level of good and bad practices. The structure and details should correspond to the form of a policy brief. Interim assessment: Students will prepare short reports on a selected issue in political and news communication for meetings during the semester (max. 20 points). Ongoing preparation and presentation of reports (five reports total during the semester) is a prerequisite for the student's admission to the course exam. Students are also required to study the assigned texts during the semester for the seminar colloquia. A/ 40-38 points B/ 37-34 points C/ 33-30 points D/ 29-27 points E/ 26-24 points FX/ less than 24 points

Learning outcomes:
Acquiring a comprehensive knowledge of intelligence and political communication and, above all, building skills in practical monitoring of the information environment. Students will navigate the online space through the course and upon completion of the course will be able to monitor the information environment through selected monitoring tools and open sources (OSINT). Skills acquired include, in particular, data collection, subsequent annotation and analysis, and comprehensive evaluation with emphasis on presentation of findings. This knowledge will, among other aspects, be essential for the use of OSINT techniques in the work of the Cyber Threat Intelligence (CTI) specialist and security analyst.

Brief outline of the course:

1. Fundamentals of political and intelligence communication; 2. Complexity and modern challenges of the information environment; 3. Cyber and cognitive security in the context of political activities and communication (threats, actors and measures); 4. Tools, opportunities and challenges of monitoring the information environment; 5. Instrumentalization of labels and narratives in political/ intelligence communication; 5. Tools, opportunities and challenges of Open Source Investigative Activities (OSINT); 6. Cyber Threat Intelligence (CTI)

Recommended literature:

AHLBERG, Micah: The OSINT Handbook: Red Team OSINT Guide. Independently Published, 2021. BAEZNER, Marie: Cyber Warfare and Cyber Intelligence: Strategies, Tactics, and Policy Implications. New York: Palgrave Macmillan, 2022. BARKER, Martin: News, Ideology, and Power. London: Routledge, 1991. BAZZELL, Michael: Open Source Intelligence Techniques: Resources for Searching and Analyzing Online Information. Bloomington: Independently Published, 2023. BELLINGCAT Investigative Team: We Are Bellingcat: An Intelligence Agency for the People. London: Bloomsbury, 2021. BENKLER, Yochai – FARIS, Robert – ROBERTS, Hal: Network Propaganda: Manipulation, Disinformation, and Radicalization in American Politics. New York: Oxford University Press, 2018. BERGER, J.M. – MORGAN, Jonathon: The ISIS Twitter Census: Defining and Disrupting the Jihadist Presence on Social Media. Washington, D.C.: Brookings Institution Press, 2015. BERINSKY, Adam J.: Political Rumors: Why We Accept Misinformation and How to Fight It. Princeton: Princeton University Press, 2022. BISHOP, T.J.: Open Source Intelligence Methods and Tools: A Practical Guide to Online Intelligence. Boca Raton: CRC Press, 2020. BLUMLER, Jay G. – KAVANAGH, Dennis: The Third Age of Political Communication. Cambridge: Polity Press, 1999. CASEY, Eoghan: Handbook of Digital Forensics and Investigation. Amsterdam: Elsevier, 2020. CLARKE, Richard A. – KNAKE, Robert: The Fifth Domain: Defending Our Country, Our Companies, and Ourselves in the Age of Cyber Threats. New York: Penguin Press, 2020. DUFOUR, Benjamin: Cyber OSINT: Intelligence Gathering in the Age of Disinformation. New York: Routledge, 2021. ESSER, Frank – PFETSCH, Barbara: Comparing Political Communication: Theories, Cases, and Challenges. Cambridge: Cambridge University Press, 2004. FARKAS, Johan – SCHOU, Jannick: Post-Truth, Fake News, and Democracy: Mapping the Politics of Falsehood. New York: Routledge, 2019. GALEOTTI, Mark: We Need to Talk About Putin: Why the West Gets Him Wrong, and How to Get Him Right. London: Ebury Press, 2019. GILES, Keir: Russia's 'New' Tools for Confronting the West: Continuity and Innovation in Moscow's Exercise of Power. London: Chatham House, 2016. HULCOOP, Adam – SCOTT-RAILTON, John: Digital Battlefield: OSINT and Geopolitical Investigations. New York: Routledge, 2020. JOLLEY, Daniel – DOUGLAS, Karen M.: The Psychology of Conspiracy Theories. London: Routledge, 2022. KATZ, Rita: ISIS: The Digital Caliphate. New York: Columbia University Press, 2018. KOTLER, Philip – KARTAJAYA, Hermawan – SETIAWAN, Iwan: Marketing 4.0: Moving from Traditional to Digital. Hoboken: Wiley, 2017. LOCK, Andrew – HARRIS, Phil: Political Marketing and the Future of Politics. New York: Routledge, 2010. LUCAS, Edward: The New Cold War: Putin's Russia and the Threat to the West. London: Bloomsbury, 2015. MAAREK, Philippe J.: Political Marketing and Communication. London: Palgrave Macmillan, 2011. MILLER, Carl: The Death of the Gods: The New Global Power Grab. London: William Heinemann, 2018. MILLER, Chris: Cyber Threat Intelligence: OSINT and Digital Espionage in Geopolitics. Boca Raton: CRC Press, 2021. MILLER, Chris: Practical Cyber Threat Intelligence: Open Source Intelligence Techniques and Tools. Boca Raton: CRC Press, 2021. MILLER, Jack: Tracking Terror: OSINT and Counterterrorism Investigations. Boca Raton: CRC Press, 2022. NEGRINE, Ralph: The Transformation of Political Communication: Continuities and Changes in Media and Politics. London: Palgrave Macmillan, 2008. NIMMO, Dan: Political Communication and Public Opinion in America. Santa Barbara: ABC-Clio, 2001. NYHAN,

Brendan – REIFLER, Jason: Misinformation and Fact-Checking in American Politics. New York: Oxford University Press, 2015. ORREN, Gary – THURBER, James A.: Media and Momentum: The New Media World and Presidential Politics. Lanham: Rowman & Littlefield, 1997. OWAD, Robert: OSINT Techniques and Tools for Investigators. Boca Raton: CRC Press, 2022. PECK, Sherri: Hunting Cyber Criminals: OSINT and Digital Evidence for Law Enforcement, Security, and Intelligence Analysts. Boca Raton: CRC Press, 2017. RID, Thomas: Active Measures: The Secret History of Disinformation and Political Warfare. New York: Farrar, Straus and Giroux, 2020. RID, Thomas: Active Measures: The Secret History of Disinformation and Political Warfare. New York: Farrar, Straus and Giroux, 2020. SCAMMELL, Margaret: Consumer Democracy: The Marketing of Politics. Cambridge: Cambridge University Press, 2014. SINGER, P.W. – BROOKING, Emerson: LikeWar: The Weaponization of Social Media. Boston: Houghton Mifflin Harcourt, 2018. SINGER, P.W. – BROOKING, Emerson: LikeWar: The Weaponization of Social Media. Boston: Houghton Mifflin Harcourt, 2018. SKOPIK, Florian: Collaborative Cyber Threat Intelligence: Detecting and Mitigating Advanced Persistent Threats. Amsterdam: Elsevier, 2017. STROMBÄCK, Jesper – KAID, Lynda Lee: The Handbook of Election News Coverage Around the World. New York: Routledge, 2008. TOUNSI, Wassim – RAIS, Anissa: Cyber-Vigilance and Digital Trust: Cyber Security in the Era of Cloud Computing and IoT. Hoboken: Wiley, 2018. WARDLE, Claire – DERAKHSHAN, Hossein: Information Disorder: Toward an Interdisciplinary Framework for Research and Policy Making. Strasbourg: Council of Europe, 2017. WIRTZ, James: Understanding Intelligence Failure: Warning, Response, and Deterrence. New York: Routledge, 2020.

Course language:

Notes:

Course assessment

Total number of assessed students: 141

A	B	C	D	E	FX
70.92	12.77	10.64	2.84	2.84	0.0

Provides: Mgr. Peter Dubóczi, PhD.

Date of last modification: 29.03.2025

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ AIM/25	**Course name:** Applied Informatics 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/NEU/24 and ÚINF/VKN/24) or (ÚINF/KRP/25 and ÚINF/DFAN/25 and ÚINF/BPS/25)

Conditions for course completion:
Appropriate knowledge and competencies in the profile subjects of one of the specializations Biomedical Informatics or Cybersecurity, demonstrating the ability to synthesize the acquired knowledge and procedures and apply them to the problems of the given specialization.

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. Biomedical informatics
2. Computer security and cybersecurity

Recommended literature:
Information sources recommended within individual profile subjects.

Course language:
Slovak

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:

Date of last modification: 29.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 122

A	B	C	D	E	FX
26.23	13.11	26.23	12.3	20.49	1.64

Provides: doc. RNDr. Ondrej Krídlo, PhD.

Date of last modification: 23.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ UIK/24	**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: 4.

Course level: II.

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: 76

A	B	C	D	E	FX
63.16	17.11	13.16	3.95	2.63	0.0

Provides: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

Date of last modification: 19.03.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 2., 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: 61

A	B	C	D	E	FX
77.05	6.56	13.11	1.64	1.64	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 27.03.2020

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PSDU/24	**Course name:** Case studies in data mining

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: 3.

Course level: II., N

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: 65

A	B	C	D	E	FX
96.92	3.08	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 19.03.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 101

A	B	C	D	E	FX
29.7	38.61	15.84	4.95	3.96	6.93

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

Date of last modification: 25.07.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KMU/25	**Course name:** Coding and multimedial data transition

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.

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: 0

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

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

Date of last modification: 05.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ POF1a/99	**Course name:** Computational Physics I

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.

Prerequisities: ÚFV/NUM/10

Conditions for course completion:
To successfully complete the course, the student must demonstrate a sufficient degree of understanding of the principles of computer solution of some typical physical problems. The basis of continuous assessment is participation and activity in exercises and work on assignments. The course ends with a final oral exam, the completion of which is conditional on the submission of all four assignments (projects) electronically and with the attached computer program. The credit evaluation of the course takes into account the following student workload: direct teaching (2 credits) and individual work on projects (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), F (0-49%).

Learning outcomes:
To teach the basic principles of computer solution of some typical physical problems. The course covers both the area of deterministic methods for solving problems by ordinary and partial differential equations as well as the area of stochastic Monte Carlo simulations and thus forms the basis for further study of more advanced computer methods contained in the follow-up course Computational Physics II.

Brief outline of the course:
1. Introduction to dynamical systems.
2. Numerical solution of systems of ordinary differential equations with initial condition.
3. Euler's method, convergence, error estimation and order of the method. One-step methods, Tylor-type and Runge-Kuta (RK2, RK4) methods.
4. Multistep methods, general linear method (explicit, implicit). Methods based on numerical quadrature.
5. Boundary value problems for ordinary differential equations.
6. Numerical solution of partial differential equations (PDE). Difference methods, their consistence, convergence and stability. Elliptic PDE.
7. Parabolic PDE, diffusion equation. Explicit and implicit methods.
8. Introduction to the Monte Carlo method. Monte Carlo integration and application in statistical physics.

9. Basics of probability theory. Monte Carlo estimate of mean and standard deviation. Central theorem of Monte Carlo sampling.
10. Simple and importance sampling. Markov chain. Perron-Frobenius theorem. Metropolis algorithm, detailed balance condition.
11. Monte Carlo simulations of lattice spin systems - application to Ising model.
12. Statistical analysis of Monte Carlo data.

Recommended literature:

Basic literature:

POZRIKIDIS, C.: Num. Comp. in Science and Engineering, Oxford Univ. Press, 2008.
GARCIA A.L.: Numerical Methods for Physics, Prentice-Hall, 1994.
LANDAU D.P., BINDER K.: A Guide to Monte Carlo Simulations in Statistical Physics, Cambridge Univ. Press, 5-th edition, 2021.

Other literature:

BERG, B.A.: Introduction to Markov Chain Monte Carlo Simulations and Their Statistical Analysis (http://www.worldscibooks.com/etextbook/5904/5904_intro.pdf)
JANKE, W.: Monte Carlo Simulations of Spin Systems (http://www.physik.uni-leipzig.de/~janke/Paper/spinmc.pdf)

Course language:

Notes:

Course assessment

Total number of assessed students: 140

A	B	C	D	E	FX	N	P
29.29	17.86	12.14	14.29	19.29	2.86	0.0	4.29

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ POF1b/99	**Course name:** Computational Physics II

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: II.

Prerequisities:

Conditions for course completion:
To successfully complete the course, the student must demonstrate a sufficient understanding of the basic methods of computer simulations of multiparticle systems. The basis of continuous assessment is participation and activity in exercises and work on assignments. The course ends with a final oral exam, the completion of which is conditional on the submission of all four assignments (projects) electronically and with the attached computer program. Credit rating of the course takes into account the following student workload: direct teaching (2 credits) and individual work on projects (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60-69%), E (50-59%), F (0-49%).

Learning outcomes:
To teach students to create simulation projects to help to solve various physical problems. To acquaint students with basic simulation methods of multiparticle systems by Monte Carlo and molecular dynamics and verify their practical implementation by preparing a computer program and analyzing the obtained results.

Brief outline of the course:
1. Methods of Monte Carlo (MC) simulations of lattice spin systems.
2. Local and cluster perturbation algorithms.
3. Errors and histogram analysis of MC data.
4. Reweighting by simple and histogram methods.
5. Universality and finite-size scaling.
6. Determination of order of phase transitions and calculation of critical exponents.
7. Basics of quantum MC simulations.
8. MC simulations of stochastic processes.
9. Diffusion equation.
10. Stochastic processes in financial analysis.
11.Basics of molecular dynamics method.
12. Discretization schemes of molecular dynamics.

Recommended literature:
Basic study literature:

LANDAU, D.P., BINDER, K.: A Guide to Monte Carlo Simulations in Statistical Physics, Cambridge Univ. Press, 5-th edition, 2021.
BOTTCHER, L., HERRMANN, H.J., Computational Statistical Physics, Cambridge Univ. Press, 2021.
Other study literature:
BERG, B.A.: Introduction to Markov Chain Monte Carlo Simulations and Their Statistical Analysis (http://www.worldscibooks.com/etextbook/5904/5904_intro.pdf)
JANKE, W.: Monte Carlo Simulations of Spin Systems (http://www.physik.uni-leipzig.de/~janke/Paper/spinmc.pdf)

Course language:

Notes:

Course assessment
Total number of assessed students: 60

A	B	C	D	E	FX
50.0	20.0	16.67	10.0	1.67	1.67

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ VKN/24	**Course name:** Computational and cognitive neuroscience

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.

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: 11

A	B	C	D	E	FX
27.27	18.18	9.09	9.09	36.36	0.0

Provides: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor, RNDr. Keerthi Kumar Doreswamy, PhD., Ing. Udbhav Singhal, Myroslav Fedorenko

Date of last modification: 19.03.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KRP/25	**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: 5	
Recommended semester/trimester of the course: 2., 4.	
Course level: II.	
Prerequisities:	
Conditions for course completion: The conditions for completing the course are: active participation in exercises, homework assignments, presentation of a selected topic in the seminar, and a final test.	
Learning outcomes: Understanding the challenges of designing secure cryptographic protocols for authentication and key management. Knowledge of methods to compromise them and the ability to apply proof techniques to verify their correctness. Proficiency with some tools for automated verification. Understanding and applying advanced cryptographic techniques in various application areas - signature schemes, electronic banking, electronic voting. Familiarity with current issues in the implementation of cryptographic protocols.	
Brief outline of the course: 1. Security goals and tools used in modern cryptography. 2. Overview of cryptographic tools, symmetric and asymmetric cryptography, cryptographic hash functions, digital signatures, certificates. 3. Authentication, authentication protocols, use of trusted centers, examples, and well-known attacks. 4. Formal model of protocol security, protocol idealization, analysis using modal logics (BAN, GNY), possibilities and limitations of proofs. 5. Key distribution protocols, possibilities for automatic error detection, formalization of protocols using process calculus, model verification in spi calculus. 6. Modeling attackers and their use in automated environments for security verification, Scyther and Tamarin tutorial. 7. Key agreements over unsecured channels, use of ephemeral keys in IKEv2 and TLS protocols, key agreement using passwords. 8. Key agreements among multiple participants, conference keys, key agreements using quantum cryptography. 9. Anonymous transfers, secret voting, interactive zero-knowledge proofs. 10-12. Seminar on current issues in cryptographic protocol security (electronic voting, RFID security, security in 3G, 4G, and 5G networks, electronic payments, digital money, blockchain, electronic auctions, secure protocols for social networks, etc.).	

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: 29

A	B	C	D	E	FX
34.48	6.9	10.34	27.59	17.24	3.45

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

Date of last modification: 05.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KIB/25	**Course name:** Cyber and Information Security

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:
To complete the course, the following are required:
1. Homework Assignments (40% of the total points)
2. Written Theoretical Test (30% of the total points)
3. Written Practical Test (30% of the total points)

Learning outcomes:
The learning outcome is an understanding of basic concepts of information security from technical, legal, and procedural perspectives.

Brief outline of the course:
1. Introduction to cyber and information security management.
2. Standardization in the field of cyber and information security.
3. Cybersecurity strategy and security policies.
4. Asset, threat, and risk management.
5. Threat modeling. The analysis of cyber threat intelligence (CTI).
6. Business continuity management of processes and activities.
7. Access control models, access matrices, attribute-based models, multi-level models, reference monitors, access monitoring and auditing.
8. Supplier relationship management.
9. Cyber and information security audit and assessment.
10. Human resources security, security awareness, and education.
11. ICT development and maintenance management, secure software development, OWASP principles for web application development.
12. Static and dynamic analysis of malicious code (malware).
13. Operational technology (OT) security.

Recommended literature:
1. OLEJÁR, Daniel et al. Foundations of Cyber and Information Security. 1st edition. Comenius University in Bratislava, 2020.
2. MARTIN, Andrew, Awais RASHID, Steve SCHNEIDER, and Howard CHIVERS. CyBOK: The Cyber Security Body of Knowledge. The National Cyber Security Centre, 2021.

3. ANDRESS, Jason, Awais RASHID, Steve SCHNEIDER, and Howard CHIVERS. Foundations of Information Security: A Straightforward Introduction. 1st edition. No Starch Press, 2019. ISBN 978-1718500044
4. PELTIER, Thomas, Awais RASHID, Steve SCHNEIDER, and Howard CHIVERS. Information Security Fundamentals. 2nd edition. Boca Raton: Auerbach Publications, 2013. ISBN 978-1138436893

Course language:
Slovak or English

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. RNDr. JUDr. Pavol Sokol, PhD. et PhD., RNDr. Eva Marková

Date of last modification: 05.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ DFAN/25	**Course name:** Digital 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: 5

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

Course level: II.

Prerequisities: ÚINF/BPD/25

Conditions for course completion:
The conditions for completing the course are:
1) Participation in exercises (20% of the total score),
2) Completion of a project – digital forensic analysis of a specific case (40% of the total score),
3) Written theoretical test (40% of the total score).

Learning outcomes:
The learning outcome is to understand the technical, legal, and procedural methods and processes in digital forensic analysis, from identifying and securing digital traces to their use in addressing security incidents or in civil or criminal proceedings.

Brief outline of the course:
1) Introduction to digital forensic analysis. Forensic investigation and the process of digital forensic analysis.
2) Legal and ethical aspects of forensic analysis, digital traces, expert activities.
3) Incident response and live forensic analysis.
4) Identification and securing of digital traces.
5) Extraction of digital traces and working with forensic images.
6) Windows Operating System Analysis I (basic aspects, system registry, logs).
7) Windows Operating System Analysis II (forensic file system artifacts, forensic program execution artifacts).
8) Windows Operating System Analysis III (user data, forensic artifacts from web browsers and email clients).
9) Linux Operating System Analysis.
10) Forensic analysis of system memory.
11) Network forensic analysis.
12) Introduction to forensic analysis of mobile devices.
13) OSINT, evaluation and presentation of digital trace analysis.

Recommended literature:
1) Sokol, Pavol, Ladislav Bačo, and Tomáš Bajtoš. Digital Forensic Analysis I. Pavol Jozef Šafárik University in Košice, 2020. ISBN 978-80-8152-916-0.
2) Arnes, André. Digital Forensics. 1st ed., Wiley, 2017. ISBN 978-1119262381.

3) Fortuna, Andrea. The Little Handbook of Windows Memory Analysis: Just Some Thoughts About Memory, Forensics, and Volatility!. 1st ed., 2019. ISBN 978-1798027400.
4) Carrier, Brian. File System Forensic Analysis. 1st ed., Addison-Wesley Professional, 2005. ISBN 978-0321268174.
5) Carvey, Harlan. Investigating Windows Systems. 1st ed., Academic Press, 2018. ISBN 978-0128114155.

Course language:
Slovak or English

Notes:
Content prerequisites: Understanding basic concepts of operating systems, computer networks, basic knowledge of the Linux shell (e.g., Bash) and PowerShell.
The course is not organized every year.

Course assessment
Total number of assessed students: 29

A	B	C	D	E	FX
41.38	31.03	13.79	6.9	6.9	0.0

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

Date of last modification: 18.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ DIPa/25	**Course name:** Diploma thesis project

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 26s
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: 62

abs	n
100.0	0.0

Provides:

Date of last modification: 08.04.2025

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ DIPb/25	**Course name:** Diploma thesis project

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 26s
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: 64

abs	n
96.88	3.13

Provides:

Date of last modification: 08.04.2025

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 11					
A	B	C	D	E	FX
45.45	9.09	36.36	9.09	0.0	0.0
Provides:					
Date of last modification: 19.11.2021					
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor					

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ EC-CSA/25	**Course name:** EC-Council Academia - Certified SOC analyst (CSA)
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: Successful completion of the EC-Council Certified SOC Analyst (CSA) examination.	
Learning outcomes: Students will gain a comprehensive methodological framework for conducting security operations within a aecurity operations center (SOC), emphasizing SOC operations, cyber threat analysis, attack methodologies, security event analysis, and incident detection. Students will acquire the knowledge and skills necessary to respond effectively to security incidents.	
Brief outline of the course: 1) Security Operations Center (SOC): Components of SOC, Types of SOC models, SOC Implementation. 2) Understanding Cyber Threats and Attack Methodology: Cyber Threats, Indicators of Compromise (IoCs). 3) Security Events and Incidents: Logging and Event Records. 4) Incident Detection with Security Information and Event Management (SIEM): Types of SIEM and Deployment. 5) Security Incident Detection with SIEM. 6) Advanced Detection with Threat Intelligence: Understanding Cyber Threat Intelligence (CTI). 7) Incident Response: The Incident Response Process. 8) Response to Specific Types of Security Incidents.	
Recommended literature: 1) EC-Council Textbook for Certified SOC analyst (CSA) 2) Thompson, E. C. Cybersecurity Incident Response: How to Contain, Eradicate, and Recover from Incidents. Apress, 2018. 3) O'Leary, Mike. Cyber Operations: Building, Defending, and Attacking Modern Computer Networks. Apress, 2015.	
Course language: english	
Notes:	

Course assessment Total number of assessed students: 0	
abs	n
0.0	0.0
Provides: doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD.	
Date of last modification: 29.11.2024	
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ EC-CTIA/25	**Course name:** EC-Council Academia - Certified threat intelligence analyst (CTIA)
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: Successful completion of the EC-Council Certified Threat Intelligence Analyst (CTIA) examination.	
Learning outcomes: Upon completion of the course, students will understand the principles of Cyber Threat Intelligence (CTI) and its lifecycle. They will be able to analyze an organization's situational awareness, identify Indicators of Compromise (IoCs), and comprehend the Kill Chain methodology. Students will acquire skills for planning and implementing a CTI program, including gaining management support and building a CTI team. Additionally, students will gain practical knowledge in data collection, processing, and analysis using CTI tools and techniques, as well as in creating CTI reports.	
Brief outline of the course: 1) Introduction to Cyber Threat Intelligence (CTI): Understanding its lifecycle and frameworks. Overview of cyber threats. 2) Understanding Cyber Threats: Advanced Persistent Threats (APTs), Indicators of Compromise (IoCs). 3) CTI Requirements, Planning, and Overview: Setting requirements, analyzing needs, and building a CTI team. 4) Data Collection and Processing for CTI: Data collection management, sources and channels, methods of data acquisition, and data processing and exploitation. 5) Data Analysis for CTI: Data analysis techniques, threat analysis process, threat intelligence evaluation, creating runbooks and knowledge bases, and CTI tools. 6) Reporting and Dissemination of Intelligence: Creating intelligence reports, building information-sharing relationships, and mechanisms and platforms for intelligence sharing.	
Recommended literature: 1) EC-Council Textbook for Certified threat intelligence analyst (CTIA) 2) Dahj, Jean Nestor M. Mastering Cyber Intelligence: Gain Comprehensive Knowledge and Skills to Conduct Threat Intelligence for Effective System Defense. Packt Publishing, 2022.	
Course language:	

english
Notes:
Course assessment Total number of assessed students: 0

abs	n
0.0	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD.
Date of last modification: 29.11.2024
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ EC-CHFI/25	**Course name:** EC-Council Academia - Computer hacking forensic investigator (CHFI)
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: Successful completion of the EC-Council CHFI certification exam is required to pass the course.	
Learning outcomes: Upon completing the course, students will master a methodological framework for conducting digital forensic investigations. They will acquire knowledge and skills in investigating various types of digital forensic cases, mobile forensics analysis, and forensic analysis of operating systems (Windows, Linux). Additionally, they will gain expertise in volatile and non-volatile data acquisition and analysis, as well as forensic methodologies for cloud infrastructure.	
Brief outline of the course: 1) Computer Forensics in Today's World 2) Computer Forensics Investigation Process 3) Understanding Hard Disks and File Systems 4) Data Acquisition and Duplication 5) Defeating Anti-Forensics Techniques 6) Windows Forensics 7) Linux and Mac Forensics 8) Network Forensics 9) Malware Forensics 10) Investigating Web Attacks 11) Dark Web Forensics 12) Cloud Forensics 13) Email and Social Media Forensics 14) Mobile Forensics 15) IoT Forensics	
Recommended literature: 1) EC-Council Textbook for Computer Hacking Forensic Investigator (CHFI) 2) Sokol, Pavol, Ladislav Bačo, and Tomáš Bajtoš. Digitálna forenzná analýza I. Univerzita Pavla Jozefa Šafárika v Košiciach, 2020. ISBN 978-80-8152-916-0. 2) Arnes, André. Digital Forensics. Wiley, 2017. ISBN 978-1119262381.	

Course language:
english

Notes:

Course assessment
Total number of assessed students: 0

abs	n
0.0	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD.

Date of last modification: 29.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ EC-ECIH/25	**Course name:** EC-Council Academia - EC-Council certified incident handler (ECIH)
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: Successful completion of the EC-Council Certified Incident Handler (ECIH) examination.	
Learning outcomes: Upon completion of the course, students will gain a methodological framework for handling cybersecurity incidents and developing policies for incident response. They will acquire the knowledge and skills to address various types of cybersecurity incidents and understand risk assessment methodologies as well as relevant legal and policy frameworks associated with incident handling.	
Brief outline of the course: 1) Introduction to Handling and Responding to Cybersecurity Incidents. 2) Process of Handling and Responding to Cybersecurity Incidents. 3) Forensic Readiness and Initial Response to Cybersecurity Incidents. 4) Handling and Responding to Cybersecurity Incidents Involving Malware. 5) Handling and Responding to Cybersecurity Incidents Related to Email Security. 6) Handling and Responding to Cybersecurity Incidents Related to Network Security. 7) Handling and Responding to Cybersecurity Incidents Related to Web Application Security. 8) Handling and Responding to Cybersecurity Incidents Related to Cloud Security. 9) Handling and Responding to Cybersecurity Threats from Insider Actors.	
Recommended literature: 1) EC-Council Textbook for EC-Council certified incident handler (ECIH) 2) Thompson, E. C. Cybersecurity Incident Response: How to Contain, Eradicate, and Recover from Incidents. Apress, 2018. 3) O'Leary, Mike. Cyber Operations: Building, Defending, and Attacking Modern Computer Networks. Apress, 2015.	
Course language: english	
Notes:	

Course assessment Total number of assessed students: 0	
abs	n
0.0	0.0
Provides: doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD.	
Date of last modification: 29.11.2024	
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KOPaHP/ PEOaIT/22	**Course name:** Electronic Commerce and IT Law

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 8

A	B	C	D	E	FX
87.5	0.0	12.5	0.0	0.0	0.0

Provides: doc. JUDr. Regina Hučková, PhD., doc. JUDr. Diana Treščáková, PhD., doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD., JUDr. Laura Bachňáková Rózenfeldová, PhD.

Date of last modification: 17.01.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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, fuzzy logic and basic clustering methods, especially in database and knowledge systems.

Brief outline of the course:
1. basic notions of Ordered sets and Formal concept analysis, motivation example
2. closure operator, closure system, Galois conection and concept lattice, example
3. basic notions of fuzzy logic, one-sided and fuzzy formal concept analysis
4. basic algorithms of Formal concept analysis
5. optimal decomposition of formal context, optimal factors, algorithms, example
6. intercontextual structures, bonds, direct products and selection of best bonds, relationship with factorisation
7. aplications on real data

Recommended literature:
1. Bělohlávek, R. (2002). Fuzzy Relational Systems: Foundations and Principles. New York: Kluwer Academic/Plenum Publishers.
2. Carpineto, C., & Romano, G. (2004). Concept Data Analysis: Theory and Applications. Hoboken, NJ: John Wiley & Sons, Inc.
3. Ganter, B., & Wille, R. (1999). Formal Concept Analysis: Mathematical Foundations. Berlin: Springer.
4. Guniš, J., Šnajder, L., Antoni, L., Eliaš, P., Krídlo, O., & Krajči, S. (2024). Formal Concept Analysis of Students' Solutions on Computational Thinking Game. IEEE Transactions on Education. doi:10.1109/TE.2024.3442612.
5. Krídlo, O., Antoni, Ľ., & Krajči, S. (2022). Selection of appropriate bonds between L-fuzzy formal contexts for recommendation tasks. Information Sciences, 606, 21-37. ISSN 0020-0255. https://doi.org/10.1016/j.ins.2022.05.047.

6. Krídlo, O., López-Rodríguez, D., Antoni, Ľ., Eliaš, P., Krajči, S., & Ojeda-Aciego, M. (2023). Connecting concept lattices with bonds induced by external information. Information Sciences, 648, 119498. ISSN 0020-0255. https://doi.org/10.1016/j.ins.2023.119498.
7. Pitka, T., Bucko, Ľ., Šnajder, L., et al. (2024). Time analysis of online consumer behavior by decision trees, GUHA association rules, and formal concept analysis. Journal of Marketing Analytics. https://doi.org/10.1057/s41270-023-00274-y.

Course language:
Slovak or English

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

Course assessment
Total number of assessed students: 101

A	B	C	D	E	FX
52.48	5.94	18.81	7.92	11.88	2.97

Provides: doc. RNDr. Ondrej Krídlo, PhD., doc. RNDr. Ľubomír Šnajder, PhD.

Date of last modification: 03.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ ZSU/25	**Course name:** Foundations of 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: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Creating a project focused on the application of machine learning algorithms in a selected application domain. Continuous written work focused on the preparation, processing and interpretation of data using machine learning methods. Successful completion of an oral exam focused on selected machine learning methods.

Learning outcomes:
Theoretical knowledge in the area of machine learning. Basic concepts of machine learning. Basic machine learning algorithms.

Brief outline of the course:
1. Basic concepts of machine learning.
2. Basic characteristics of data, types of attributes, characteristics for individual attributes, dependence between attributes.
3. Data sources and their acquisition. Determining the target task.
4. Preparation and cleaning of data, missing values, incorrect inputs.
5. Classification tasks
6. Selected classification methods
7. Evaluation of models - true positive, false positive, true negative, false negative examples.
8. Classification accuracy indicators.
9. Cluster analysis.
10. Association rules.
11. Prediction tasks and selected prediction methods
12. Prediction accuracy indicators.

Recommended literature:
1. AGGARWAL, Charu C. Data mining: a textbook. Cham: Springer, 2015. ISBN 978-3-319-14141-1.
2. ALPAYDIN, Ethem. Introduction to machine learning. 3rd ed. Massachusetts: MIT Press, 2014. ISBN 978-0-262-02818-9.
3. RASCHKA, Sebastian, Mirjalili, Vahid. Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2, 3rd Edition, Packt Publishing Ltd., 2019. ISBN 978-1789955750.

4. WITTEN, I. H., Eibe FRANK a Mark A. HALL. Data mining: practical machine learning tools and techniques. 4th ed. Amsterdam: Morgan Kaufmann, 2017. Morgan Kaufman series in data management systems. ISBN 9780128042915.

Course language:
Slovak or English

Notes:
Content prerequisites:
Basics of programming in Python, or another alternative programming language suitable for data analysis

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. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 05.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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.

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.
2. Color, grayscale, binary image. Thresholding, histogram, histogram equalisation. Mathematical morphology.
3. Noise, noise removal. Filtering, convolution.
4. Frequency domain filtering, Fourier transformation, convolution theorem, sinusoid, sampling, aliasing. Method of least squares, RANSAC. Hough transform for line and circle detection.
5. Edge detection, gradient, Laplacian, Canny edge detector, corner detection.
6. Image segmentation. Clustering (k-means, meanshift). Grabcut. Active contour method. Textures.
7. Features. Blob detection. SIFT detector and descriptor. Geometric transformations.
8. Recognition. Machine learning and neural networks in computer vision. Image preprocessing, image whitening, data augmentation. Face detection, Haar features.
9. Object tracking in image sequences, mixture of Gaussians, template matching, tracking.
10. Image formation - pinhole camera. Projection from 3D to 2D, external and internal matrix, camera calibration, epipolar geometry, depth of image.

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.
5. NAYAR, Shree. First Principles of Computer Vision. [online: https://fpcv.cs.columbia.edu/]

Course language:
Slovak, English.

Notes:

Course assessment
Total number of assessed students: 71

A	B	C	D	E	FX
49.3	15.49	14.08	8.45	12.68	0.0

Provides: RNDr. Miroslav Opiela, PhD.

Date of last modification: 24.05.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 1., 3.

Course level: 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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 2., 4.

Course level: 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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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., 4.

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: 194

A	B	C	D	E	FX
21.13	29.9	25.26	8.76	11.34	3.61

Provides: prof. RNDr. Gabriel Semanišin, PhD., RNDr. Viliam Kačala, PhD.

Date of last modification: 23.11.2021
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 136

A	B	C	D	E	FX
59.56	19.85	11.76	3.68	0.0	5.15

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 08.02.2022
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KOP/ PDVaIT/22	**Course name:** Intellectual Property Law and information technologies

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: 4.

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: 9

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

Provides: doc. JUDr. Renáta Bačárová, PhD., LL.M.

Date of last modification: 19.06.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ UKN/24	**Course name:** Introduction to cognitive and neural sciences

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: I., II., N

Prerequisities:

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

Learning outcomes:
Overview anatomy, physiology, and cognitive processes in the human brain with focus on computational aspects of cognition and computational tools used in neuroscience.

Brief outline of the course:
1. Intro to neural and cognitive science
2. Overview of anatomy and physiology of the central nervous system (CNS)
3. Methods of study in neuroscience. Sensory, motor and associative brain areas.
4. Neuron: anatomy, types, action potential
5. Propagation of signals in the neuron, neural coding.
6. Synaptic transmission and plasticity - neural basis of learning and memory.
7. Psychology of memory and learning.
8. Vision: Intro. Perception of brightness, edges, color. Model BCS/FCS. Perception of size and sitance.
9. Hearing and auditory cognition.
10. Language, psycholinguistics, speech perception and production.
11. Attention.
12. Crossmodal interaction (vision, hearing, touch).
13. Reasoning and decision making.

Recommended literature:
1. Poeppel D., Mangun G., Gazzaniga M. (ed.): The Cognitive Neurosciences. 6th ed. MIT Press. 2020. ISBN-13: 978-0262043250
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

Course language:

Slovak or English

Notes:
Content prerequisites:
Algebra, programming (Matlab).

Course assessment
Total number of assessed students: 9

A	B	C	D	E	FX
44.44	0.0	11.11	0.0	44.44	0.0

Provides: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor, Ing. Peter Lokša, PhD., RNDr. Keerthi Kumar Doreswamy, PhD., Ing. Udbhav Singhal, Myroslav Fedorenko

Date of last modification: 19.03.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 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: 164

A	B	C	D	E	FX
17.68	19.51	25.61	19.51	16.46	1.22

Provides: doc. RNDr. Csaba Török, CSc.

Date of last modification: 23.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ NEU/24	**Course name:** Neural 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: 1.

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: 107

A	B	C	D	E	FX
32.71	19.63	20.56	12.15	13.08	1.87

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

Date of last modification: 19.03.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 33

A	B	C	D	E	FX
42.42	21.21	24.24	9.09	3.03	0.0

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 04.01.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 1., 3.

Course level: 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: 108

A	B	C	D	E	FX
71.3	17.59	6.48	1.85	2.78	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 22.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 2., 4.

Course level: 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: 64

A	B	C	D	E	FX
87.5	6.25	4.69	1.56	0.0	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 08.09.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 153					
A	B	C	D	E	FX
27.45	17.65	14.38	13.07	24.84	2.61
Provides: RNDr. Peter Gurský, PhD.					
Date of last modification: 04.01.2022					
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor					

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: 63

A	B	C	D	E	FX
19.05	6.35	19.05	20.63	23.81	11.11

Provides: doc. RNDr. Jozef Jirásek, PhD., RNDr. Rastislav Krivoš-Belluš, PhD., RNDr. Ladislav Mikeš, PhD., doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 23.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ LEK1/02	**Course name:** Physical Principles of Medical Diagnostics and Therapy

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: 2

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

Course level: II.

Prerequisities:

Conditions for course completion:
To complete successfully the course, the student has to demonstrate the understanding of the basic notions and the physical principles of medical technology, especially of the diagnostic (imaging). In addition to attending classes, it is necessary for the student to study some specifics (details) of the discussed issues within self-study. The conditions for obtaining credits is, in addition to participation in teaching and passing the final exam, a successful completion of a written test. The minimum limit for passing the exam is to obtain 51% of the total score, which takes into account all required activities. The credit evaluation takes into account the following student workload: direct teaching - 1 credit, self-study of recommended literature - 1 credit, continuous study for the test and evaluation - 1 credit.
Rating scales: A - 91% -100% points, B - 81% -90% points, C - 71% -80% points, D - 61% -70% points, E - 51% -60% points.

Learning outcomes:
After completing the lectures, the student will have the knowledge to understand the principles and operation of modern medical devices, such as e.g. ultrasound diagnostics, computed transmission tomography, computed emission (positron) tomography, magnetic (resonance) tomography, radiotherapy and lasers, and to be able to explain the principles and use of the facilities to others. The acquired knowledge should also be a good prerequisite for a possible employment of the student in companies producing or operating modern medical technology.

Brief outline of the course:
1. Division of medical technology into diagnostic and therapeutic. A brief history of medical technology.
2. Ultrasound diagnostics (USG). Basic terms - used frequencies, wave intensities, acoustic impedance, ultrasound generation, absorption of ultrasonic waves, reflection and refraction of waves, space resolution, focusing of waves. Types of ultrasound imaging: type A and B imaging, creation of a dynamic (real time) image, time imaging (time motion). Some methods of signal processing: digitization, time-dependent signal balancing, etc.
3. Ultrasound diagnostics based on Doppler effect. Systems with unmodulated and modulated carrier waves, examination of blood flow in the organism. Possibilities of ultrasound diagnostics and

its advantages. Interaction of ultrasound with tissues (active and passive), principles of ultrasound therapy.
4. Transmission computed tomography (CT). Absorption of X-rays in tissues, evaluation of relationships between the intensity of incident and the intensity of penetrated radiation, image constructions.
5. Construction of a CT equipment, X-ray source, detection system, evaluation and processing of results. Types (generations) of CT devices. Implementation of CT examination and image evaluation. 6. Emission computed tomography (ET). Single-photon emission tomography - selection of suitable radionuclides and evaluation of the distribution of radionuclides in the body.
7. Construction of emission tomograph, benefits and use of emission tomography. Positron emission tomography (PET). Positron emitters, positron - electron annihilation, coincident photon detection. Construction of PET equipment, benefits and use of PET.
8. Thermography - basic concepts. Contact thermography - properties of liquid crystals, detection of changes in surface temperature of an organism. Contactless thermography. Radiation of bodies, detection of infrared radiation, distribution and properties of detectors. Thermograph design, use of thermography in medicine and other areas.
9. Magnetic (resonance) tomography (MR/MT). Principles of nuclear magnetic resonance - magnetic moment of the nucleus, movement (precession) of magnetic moments in magnetic field. Longitudinal and transverse relaxation times, causes of their change. Methods of measuring relaxation times.
10. Acquisition of image information - use of magnetic field gradients, methods of their creation. Design of magnetic tomographs - basic magnet, high frequency coils, shielded rooms, evaluation systems. Possibilities and use of MT, the use of contrast agents.
11. Lasers in medical technology. Principle of laser operation, spontaneous and induced emission, three-level lasers (solid, gas), construction of lasers. Properties of laser radiation and the effect of laser beam on biological objects (tissues). Use of lasers in various fields of medicine.
12. Principles of radiotherapy. Interaction of various ionizing particles (photons, electrons, neutrons, protons) with the environment. Biological effects of ionizing radiation, applied doses, survival curves. New methods of irradiation, the use of Bragg maximum in hadron irradiation therapy, neutron capture therapy. Possibilities of ionizing radiation beam modification.

Recommended literature:

- Režňák I. et al., Modern imaging methods in medical diagnostics, Vyd. Osveta, Martin, 1992.
- Jurga Ľ. et al., Basics of Medical Radiology, Script of LF UPJŠ, Košice, 1990.
- Mc Ainsh T.F., Physics in Medicine and Biology, Pergamon Press, Oxford, 1987.
- Huda W., Slone R.M., Review of Radiologic Physics, Lippincot, London, 1995
- Bushberg J.T, et al., The essential physics of imaging, Lippincott Williams, Philadelphia, 2002.

Course language:

Slovak, English

Notes:

Recommended range of lessons (in hours): Weekly: 2/0
For the period of study: 26/0
Method of study: Teaching is carried out in person, if necessary remotely, in the environment of MS Teams.
Number of ECTS credits: 3
Degree of studz: I. resp. II.
Prerequisites: none

Course assessment
Total number of assessed students: 44

A	B	C	D	E	FX
88.64	9.09	2.27	0.0	0.0	0.0

Provides: doc. RNDr. Karol Flachbart, DrSc.

Date of last modification: 06.10.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 125

abs	n
98.4	1.6

Provides:
Date of last modification: 08.01.2022
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 24

A	B	C	D	E	FX
54.17	25.0	16.67	4.17	0.0	0.0

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

Date of last modification: 26.09.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ RIAM/25	**Course name:** Reverse Engineering and Malware Analysis

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: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:
The completion of the course requires working on a graded final project.

Learning outcomes:
Students will acquire fundamental knowledge and skills for translating machine code into instructions and source code, and knowledge of code analysis. They will also gain essential knowledge of analyzing malicious code (malware) in Windows and Linux operating systems.

Brief outline of the course:
1. Introduction to reverse engineering and malware analysis
2. Programming language C
3. Basic aspects of assembly language
4. Translating machine code into instructions and source code (Disassemblers and Decompilers)
5. Dynamic analysis of machine code
6. Code analysis and debugging
7. Advanced reverse engineering techniques
8. Advanced malware analysis techniques
9. Basics of reverse code analysis in the Windows operating system
10. Basics of reverse code analysis in the Linux operating system
11. Embedded devices firmware extraction and analysis
12. Reverse analysis of embedded devices firmware

Recommended literature:
Silberschatz, A., Peterson, J. L., & Galvin, P. B. Operating System Concepts. 10th Revised Edition. New York, United States: John Wiley, 2021. ISBN 9781119800361.
Dang, B., Gazet, A., & Bachaalany, E. Practical Reverse Engineering: x86, x64, ARM, Windows Kernel, Reversing Tools, and Obfuscation. John Wiley & Sons, 2014.
Sikorski, M., & Honig, A. Practical Malware Analysis: The Hands-on Guide to Dissecting Malicious Software. No Starch Press, 2012.

Course language:
Slovak or English

Notes:

Content prerequisites: Understanding of x86, x86_64 and ARM architectures and internals. Required knowledge of the principles of GPIO operation, Interrupts, low-level communication, clock signal distribution, Timers, DMA, and buses in a digital integrated circuit.
The course is not organized every year.

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: RNDr. PhDr. Peter Pisarčík

Date of last modification: 05.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PPU1a/25	**Course name:** Running practice

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 26s
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: 100

abs	n
96.0	4.0

Provides: Ing. Miron Kuzma, PhD.
Date of last modification: 08.04.2025
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PPU1b/25	**Course name:** Running practice

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 39s
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: 67

abs	n
98.51	1.49

Provides: Ing. Miron Kuzma, PhD.
Date of last modification: 08.04.2025
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 2., 4.

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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: 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: 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: 62

abs	n
9.68	90.32

Provides: Mgr. Agata Dorota Horbacz, PhD.

Date of last modification: 29.03.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ BPS/25	**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: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:
The requirements for completing the course are:
1. Active participation in exercises (20% of the total score),
2. Homework assignments (30% of the total score),
3. Written exam (50% of the total score).

Learning outcomes:
Understand the nature and importance of network security threats and methods for securing computer networks. Be able to identify security vulnerabilities and implement security measures, including the use of standard network security technologies such as firewalls, intrusion detection and prevention systems, and honeypots. Understand the principles and risks of security protocols like SSL and IPsec and know how to use them. Be capable of collecting and analyzing network security data and logs from network security devices.

Brief outline of the course:
1. Introduction to network security. Network situational awareness.
2. Data transmission security at the data link layer of the communication model, data flow management in local networks, switching, STP, virtualization, MACsec, multiprotocol switching.
3. Security of wireless networks and transmissions, WLAN networks, authentication mechanisms for WDS, data transmission over mobile networks (GSM, LTE).
4. Remote access to local networks, EAP authentication, RADIUS protocol, trust management, certificate usage, certification process, tasks of a certification authority.
5. Security of IPv4 and IPv6 network protocols, potential attacks and protection, IPsec protocol, security associations and policies, cryptographic information exchange.
6. Security of transport protocols TCP and UDP, TLS protocol, securing data in TLS sessions, tunneling, VPN.
7. Security aspects of Internet application-layer protocols, DNSSEC.
8. Security gateway architecture (firewall), demilitarized zone, filtering rules.
9. Security information and event management. Analysis and aggregation of network data.
10. Intrusion detection and prevention, honeypots. Approaches to data analysis.
11. Network monitoring. Flow analysis.
12. Analysis and prediction of situational awareness.

Recommended literature:

1. Kizza, Joseph Migga. Guide to Computer Network Security. 6th ed., Springer, 2024.
2. Van Oorschot, Paul C. Computer Security and the Internet: Tools and Jewels from Malware to Bitcoin. Springer, 2020.
3. Andress, Jason. Cyber Operations: Building, Defending, and Attacking Modern Computer Networks. Apress, 2019.

Course language:

Slovak or English

Notes:

Content prerequisites: To complete the course, knowledge from the courses ÚINF/PSIN/15 - Computer network Internet and ÚINF/UIB1/21 - Introduction to information security is assumed. The course is not organized every year.

Course assessment

Total number of assessed students: 31

A	B	C	D	E	FX
25.81	16.13	19.35	12.9	22.58	3.23

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD., RNDr. Tomáš Bajtoš, PhD., RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 18.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ BPD/25	**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: II.

Prerequisities:

Conditions for course completion:
To complete the course, students must:
1. Participate in seminars (20% of the total score).
2. Complete assignments (30% of the total score).
3. Pass a written exam (50% of the total score).

Learning outcomes:
Students will familiarize themselves with the concepts, methods, and tools to ensure the confidentiality, integrity, and availability of data and computer systems. The course provides detailed insights into securing data in Windows and Linux operating systems as well as in cloud environments. Upon completing the course, students will acquire the knowledge necessary for designing and implementing data and system security, including analyzing security events.

Brief outline of the course:
1. Introduction to security of computer systems and data, Security concepts and principles. Threats, attacks, and assets. Security functional requirements.
2. Windows operating system security. Security configuration settings. Encryption. Technologies to prevent malware execution.
3. Introduction to active directory. Kerberos protocol. Best practices for secure Active Directory management. Group policies.
4. Standard attacks on Active Directory. Credential theft attacks (Pass-the-Hash, Kerberoasting). Attacks exploiting Kerberos vulnerabilities (Golden Ticket, Silver Ticket). Lateral movement using Active Directory (Pass-the-Hash, Pass-the-Ticket).
5. Linux operating system security. Encryption (GPG, LUKS). User account security. Kernel security. Process isolation.
6. Access control in Linux operating systems. Discretionary Access Control (DAC), access control lists. Mandatory Access Control (MAC), implementing SELinux and AppArmor.
7. Public Key Infrastructure (PKI). Certificate Authorities. Certificates (X.509 standard) and their lifecycle. Pretty Good Privacy (PGP).
8. Database system security. Concepts and security of relational databases. Data integrity in database systems. Access control.

9. Cloud data security. Analysis of the Microsoft Azure cloud environment. Security incident response in Azure.
10. Monitoring and logging events in Windows OS. Log structure and sources. Types of events.
11. Monitoring and Logging Events in Linux OS. Syslog. Journald.
12. Data Analysis in SIEM (Security Information and Event Management). Data collection and storage. Normalization, aggregation, and correlation of data.

Recommended literature:

1. Forshaw, James. Windows Security Internals: A Deep Dive into Windows Authentication, Authorization, and Auditing. No Starch Press, 2024.
2. Yosifovich, Pavel, et al. Windows Internals, Part 1: System Architecture, Processes, Threads, Memory Management, and More. 7th ed., Microsoft Press, 2017. ISBN 978-0735684188.
3. Allievi, Andrea, et al. Windows Internals, Part 2. 7th ed., Microsoft Press, 2021. ISBN 978-0135462409.
4. Stallings, William. Computer Security: Principles and Practice. 4th ed., Pearson, 2017. ISBN 978-0134794105.
5. Tevault, Donald A. Mastering Linux Security and Hardening: A Practical Guide to Protecting Your Linux System from Cyber Attacks. 3rd ed., Packt Publishing, 2023. ISBN 978-1837630516.

Course language:
Slovak or English

Notes:
Content Prerequisites:
Students are expected to have a basic understanding of operating systems, Windows and Linux operating systems, and database fundamentals.
The course is not offered every year.

Course assessment
Total number of assessed students: 34

A	B	C	D	E	FX
20.59	17.65	17.65	20.59	23.53	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD. et PhD., RNDr. Tomáš Bajtoš, PhD., RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 18.11.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 55

A	B	C	D	E	FX
74.55	7.27	9.09	3.64	1.82	3.64

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 17.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 212

abs	n
95.75	4.25

Provides:

Date of last modification: 08.01.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 197

abs	n
99.49	0.51

Provides:

Date of last modification: 08.01.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 170

abs	n
100.0	0.0

Provides:

Date of last modification: 08.01.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SPa/24	**Course name:** Software project I

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 52s
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Active participation in the project. Participating in regular project team meetings. 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:
The course is realized as part of "Živé projekty" (Live projects) in cooperation with the Technical University of Košice and several software companies. Students work in a team of 4-5 members to develop, test and present a software product under the guidance of a mentor from a university or a software company.
1. Team creation and project selection takes place at the beginning of October
2. Students meet with the project mentor on a weekly basis and continuously work on the creation of a software product
3. Around mid-January, students submit a video with a short presentation of the project
4. At the beginning of February, the project presentation takes place. The best teams are awarded with material prizes.

Recommended literature:
The sources of information depend on the selected project.

Course language:
Slovak or English

Notes:
Content prerequisities: advanced programming skills.

Course assessment Total number of assessed students: 49					
A	B	C	D	E	FX
77.55	6.12	2.04	4.08	8.16	2.04
Provides: RNDr. Peter Gurský, PhD.					
Date of last modification: 06.09.2024					
Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor					

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SPb/24	**Course name:** Software project II

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 52s
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Active participation in the project. Participating in regular project team meetings. 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.

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3. Around mid-January, students submit a video with a short presentation of the project
4. At the beginning of February, the project presentation takes place. The best teams are awarded with material prizes.

Recommended literature:
The sources of information depend on the selected project.

Course language:
Slovak or English

Notes:
Content prerequisities: advanced programming skills.

Course assessment
Total number of assessed students: 19

A	B	C	D	E	FX
84.21	5.26	5.26	0.0	0.0	5.26

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 06.09.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚGE/ PAM1/21	**Course name:** Spatial analyses and modelling

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

Number of ECTS credits: 6

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

Course level: II.

Prerequisities:

Conditions for course completion:
The evaluation is based on a combination of continuous tests in the lecture, submitted technical reports submitted at the exercises and the final exam. From the point of view of the organization of the subject, first the individual topics are taught at the theoretical and methodological level in lectures and then they are demonstrated in exercises on selected case studies and tasks.
Continuous control at the lecture with a weight of 20% is carried out through tests. During the semester, students take 2 tests focused on the computational solution of assigned tasks. From each test it is necessary to obtain a rating at least at the level of grade E.
The outputs from each exercise are passed on to the next exercise at the latest. During the semester, students will receive 2 separate assignments, the aim of which will be to apply selected methods of spatial analysis and modeling of spatial phenomena for a defined area of interest. The result will be a technical report containing a description of the data, methods and software used, analysis of the results and their interpretation. The technical report from these separate assignments represents 50% of the weight in the final evaluation, while it is necessary to obtain a minimum grade E level from each technical report.
A student who submitted all the results of the exercises on time and obtained an evaluation of both submitted technical reports at least at the level of grade E can apply for the exam. The final exam is carried out in the form of a test and weighs 30% overall at least at grade E.
The final evaluation is a weighted average of evaluations from continuous control (20%), submitted technical reports (50%) and exams (30%). Credits will only be awarded to a student who achieves a grade of at least E in each part of the assessment. Assessment scale: A (100-91%), B (81-90%,) C (71-80%), D (61- 70%), E (51-60%).

Learning outcomes:
Knowledge: The student will gain knowledge and overview in the concepts of spatial analysis and modeling of spatial phenomena using geodata in the geographic information system. They will get acquainted with the theoretical and methodological basis of selected spatial analyzes and approaches to modeling spatial phenomena.
Skills: The student will learn to prepare spatial data for spatial analysis and modeling of spatial phenomena. They will get acquainted with specialized software tools, modules and extensions for GIS. Can perform spatial analyzes and model selected spatial phenomena, evaluate the suitability of their use and interpret the results of spatial analysis and modeling of spatial phenomena.

Competences: The student is able to design a procedure for the analysis of spatial phenomena using geodata with a high degree of independence and evaluate the suitability of the methods used in their analysis.

Brief outline of the course:

Lectures:

Basic concepts of spatial analysis, their definition and classification; Point field analysis and spatial autocorrelation, distance analyzes; Graph theory and network analysis; Nuclear density analysis; Geographically weighted regression; Trend surface and multivariate spline; Geostatistical concept of spatial dependence; Spatio-temporal analysis and modeling, TimeGIS; Solar radiation modeling; Water flow and erosion modeling; Cellular automata; Fluid dynamics modeling

Exercises: Software tools for spatial analysis and modeling; Point field analysis and spatial autocorrelation, distance analyzes; Graph theory and network analysis; Nuclear density analysis; Geographically weighted regression; Trend surface and multivariate spline; Geostatistical concept of spatial dependence; Spatio-temporal analysis and modeling, TimeGIS; Solar radiation modeling; Water flow and erosion modeling; Cellular automata; Fluid dynamics modeling

Recommended literature:

KAŇUK, J., 2015. Priestorové analýzy a modelovanie. Vysokoškolské učebné texty. Prírodovedecká fakulta Univerzity Pavla Jozefa Šafárika v Košiciach. 114 s.

HLÁSNY, T. 2007: Geografické informačné systémy - Priestorové analýzy. Zephyros& Národné lesnícke centrum - Lesnícky výskumný ústav, Zvolen.

LLOYD, CH. 2009: Spatial Data Analysis. An Introduction for GIS users. Oxford University Press, Oxford.

BAILEY, T.C., GATRELL, A.C., 1995. Interactive spatial data analysis. Essex, Longman Scientific & Technical.

LONGLEY, P.A., BATTY, M. (eds.)., 2003. Advanced spatial analysis : the CASA book of GIS. Redlands, ESRI.

FISHER, M.M., LEUNG, Y. (2001). Geocomputational Modelling: techniques and applications. Berlin, Springer.

O'SULLIVAN, D.,UNWIN, D. (2002). Geographic Information Analysis. Wiley&Sons.

FISCHER, MM., GETTIS, A. (eds). (2010). Handbook of applied spatial analysis: software tools, methods and applications. Berlin, Springer.

FOTHERINGHAM, A. S., C. BRUNSDON, CHARLTON, M. (2000). Quantitative Geography: Perspectives on Spatial Data Analysis. Sage.

FOTHERINGHAM, S., ROGERSON, P. (1994). Spatial analysis and GIS. London, Taylor & Francis.

HAINING, R. P. (2003). Spatial data analysis: Theory and practice. New York: Cambridge University Press.

Course language:

Notes:

Course assessment

Total number of assessed students: 25

A	B	C	D	E	FX
40.0	36.0	8.0	4.0	8.0	4.0

Provides: prof. Mgr. Jaroslav Hofierka, PhD., Mgr. Jozef Šupinský, PhD.

Date of last modification: 23.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 41

abs	n
100.0	0.0

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

Date of last modification: 17.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 46

abs	n
91.3	8.7

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

Date of last modification: 17.11.2021

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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., P

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: 15781

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
85.74	0.06	0.0	0.0	0.0	0.04	9.0	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., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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., P

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: 13802

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
83.85	0.49	0.01	0.0	0.0	0.04	11.17	4.43

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., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 9334

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
87.96	0.06	0.01	0.0	0.0	0.02	4.92	7.03

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., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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: 5846

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
82.54	0.27	0.03	0.0	0.0	0.0	8.24	8.91

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., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ SVK2/24	**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: 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: 101

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

Provides:

Date of last modification: 24.03.2024

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

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., P

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: 232

abs	n
36.64	63.36

Provides: Mgr. Dávid Kaško, PhD.

Date of last modification: 29.03.2022

Approved: doc. Ing. Norbert Kopčo, PhD., univerzitný profesor

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚTVŠ/ KP/12	**Course name:** Survival Course

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., P

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 the tasks defined in the course syllabus

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 should:
- acquire knowledge about safe stay and movement in natural environment,
- obtain theoretical knowledge and practical skills to solve extraordinary and demanding situations connected with survival and minimization of damage to health,
- be able to resist and face situations related to overcoming barriers and obstacles in natural environment,
- be able implement the acquired knowledge as an instructor during summer sport camps for children and youth within recreational sport.

Brief outline of the course:
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1. Principles of conduct and safety in the movement in unfamiliar natural environment
2. Preparation and guidance of a hike tour
3. Objective and subjective danger in the mountains
4. Principles of hygiene and prevention of damage to health in extreme conditions
5. Fire building
6. Movement in the unfamiliar terrain, orientation and navigation
7. Shelters
8. Food preparation and water filtering
9. Rappelling, Tyrolian traverse
10. Transport of an injured person, first aid

Recommended literature:

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

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 461

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46.2	53.8

Provides: Mgr. Ladislav Kručanica, PhD.

Date of last modification: 16.05.2023

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