CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PRR1a/15	**Course name:** Advanced programming

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.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 71

A	B	C	D	E	FX
53.52	7.04	8.45	4.23	21.13	5.63

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PRR1b/15	**Course name:** Advanced programming

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.

Prerequisities: ÚINF/PRR1a/15

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 42

A	B	C	D	E	FX
47.62	4.76	0.0	21.43	16.67	9.52

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PPPy/18	**Course name:** Advanced programming in Python

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: 6., 8.

Course level: I., N

Prerequisities: ÚINF/PAZ1a/15

Conditions for course completion:
At least 50 % of the marks in the continuous assessment
A minimum of 50 % marks in the mid-term and end-of-semester practical tests
or
The final project - 100%

Learning outcomes:
Implement solutions to selected problems in Python using available modules. Use and implement non-trivial algorithms to solve selected problems. Use an object-oriented approach to problem solving. Program in Python in an object-oriented manner using Python specifics. Test programs. Implement parallel computing.

Brief outline of the course:
1. Introduction to the environment, basic features of Python, simple and structured data types.
2. Input, output, function definition, lambda function, generator notation, function as parameter, string formatting.
3. Control structures, iterating over data structures, context manager.
4. Exception handling and exception raising. Philosophy of exceptions in Python.
5. Working with files. Serialization and deserialization of data - json and pickle protocol. Text and binary files. Manipulation with files. Open data.
6. Object-oriented programming 1. Design of custom classes, special methods, properties, philosophy of accessing methods and attributes.
7. Object-oriented programming 2. Comparison and differences with Java. Multiple inheritance.
8. Method overloading. Static methods, abstract classes, data class.
9. Decorators, memoization, modules, packages.
10. Code validation (debugging), testing (doctest, unittest), test-driven development.
11. Parallel computing, processes, process triggering and inter-process communication (shared variable, pipe, queue).
12. Graphical program design and implementation.

Recommended literature:
PILGRIM, Mark. Dive into Python 3. 2. United States of America: Apress, 2004. ISBN 978-1430224150. Dostupné také z: https://diveintopython3.net/

SHIPMAN, John W. Tkinter 8.5 reference: a GUI for Python. Socorro, NM 87801: New Mexico Tech Computer Center, 2013. Dostupné také z: https://anzeljg.github.io/rin2/book2/2405/docs/tkinter/tkinter.pdf
LOTT, Steven F. Mastering Object-oriented Python. Birmingham B3 2PB, UK: Packt Publishing, 2014. ISBN 978-1-78328-097-1.

Course language:
Slovak language, knowledge of English language is only required to read documentation of Python.

Notes:

Course assessment
Total number of assessed students: 65

A	B	C	D	E	FX
7.69	13.85	18.46	18.46	24.62	16.92

Provides: PaedDr. Ján Guniš, PhD.

Date of last modification: 10.02.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ ASU1/15	**Course name:** Algorithms and data structures

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: 6.

Course level: I., N

Prerequisities: ÚINF/PAZ1a/15 and ÚINF/PAZ1b/15

Conditions for course completion:
Practice activities, homeworks and midterm exam.
Final examination consisting of practice and theoretical test.

Learning outcomes:
Understand and learn algorithmic paradigms and data structures. Analyse time complexity of these algorithms.

Brief outline of the course:
Algorithms' time and space asymptotic complexity. Main Theorem. Amortized complexity.
Brute Force. Backtrack. Divide and Conquer. Dynamic programming. Comparison and non-comparison sort algorithms. Sweep line algorithms. Graph Theory Algorithms.
Data structures – queue, stack, priority queue, heap, prefix sum, binary search trees, interval trees, union & find, trie.

Recommended literature:
1, Laaksonen A.: Guide to Competitive Programming: Learning and Improving Algorithms Through Contests (Undergraduate Topics in Computer Science), Springer, 2017, ISBN 978-3319725468
2, Forišek M., Steinová M.: Explaining Algorithms Using Metaphors. Springer Briefs in Computer Science, Springer (2013), ISBN 978-1-4471-5018-3
3, R. Sedgewick, K. Wayne: Algorithms (4th Edition), Addison-Wesley Professional, 2011, ISBN 978-0321573513, http://algs4.cs.princeton.edu/home/
4, Open Data Structures: http://opendatastructures.org/

Course language:
Slovak or english

Notes:
Content prerequisities:
- programming skills in some programming language (Python/Java/C++/...)
- mathematics:
-- computing with polynomials, logarithmic and exponential functions
-- computing limits of sequences, L'Hospital rule

Course assessment
Total number of assessed students: 184

A	B	C	D	E	FX
13.59	4.35	16.85	25.0	36.96	3.26

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ AFJ1a/15	**Course name:** Automata and formal languages

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: 4., 6., 8.

Course level: I., N

Prerequisities:

Conditions for course completion:
Oral examination.

Learning outcomes:
To provide theoretical background for studying computer science in general, by giving the necessary knowledge in theory of automata.

Brief outline of the course:
1: Chomsky hierarchy of grammars: alphabet, symbol (letter, character), transitive closure, word (string), empty word (empty string), length of a string, concatenation, language, grammar, nonterminal symbol, terminal symbol, initial nonterminal (initial symbol), grammar rule, derivation step, language generated by a grammar, Chomsky hierarchy of grammars - phrase-structure, context sensitive, context free, regular
2: Deterministic finite state automata: finite state automaton, state, input symbol, output symbol, initial state, transition function, output function, examples of automata and their graphic representation, generalized transition and output functions and their basic properties
3: Reduction of automata I: equivalent automata, minimal (optimal) automaton, reachable state, properties of reachable states, elimination of unreachable states
4: Reduction of automata II: equivalent states, k-equivalent states, properties of equivalence and k-equivalence, relation between k-equivalence and (k+1)-equivalence, partitioning the state set into equivalence classes, elimination of equivalent states
5: Reduction of automata III: proof of correctness, unambiguity, and optimality of reduced automaton, testing equivalence of two automata
6: Deterministic finite state acceptors: basic definitions, language recognized by a finite state acceptor, common properties of acceptors and automata with an output, minimizing a finite state acceptor
7: Operations with regular languages: complement, intersection, union, difference, symmetric difference, testing of emptiness, inclusion, equality, and disjointness for regular languages
8: Nondeterministic finite state acceptors: definition, transition function, language recognized by a nondeterministic acceptor, elimination of nondeterminism
9: epsilon-acceptors: definition, properties, elimination of epsilon-transitions

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

Recommended literature:

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

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 895

A	B	C	D	E	FX
26.59	18.21	23.46	17.09	9.83	4.8

Provides: prof. RNDr. Viliam Geffert, DrSc., RNDr. Dominika Pališínová, RNDr. Juraj Šebej, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ AFJ1b/15	**Course name:** Automata and formal languages

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 5., 7.

Course level: I., II.

Prerequisities: ÚINF/AFJ1a/15

Conditions for course completion:
Test and oral examination.

Learning outcomes:
To provide theoretical background for studying computer science in general, by giving the necessary knowledge in theory of automata.

Brief outline of the course:
1: Pushdown automata: definition of a pushdown automaton, accepting by final states, accepting by empty pushdown
2: Deterministic pushdown automata: examples of application in practice
3: Context-free grammars: basic definition, leftmost derivation, derivation tree, elimination of rules of type A→epsilon and A→B, Chomsky normal form
4: Relation between context-free grammars and pushdown automata: transforming context-free grammar to a pushdown automaton, transforming pushdown automaton to a context-free grammar
5: Pumping lemma I: Statement of the lemma and its proof
6: Pumping lemma II: applications of the lemma
7: Closure properties of context-free languages
8: Closure properties of deterministic context-free languages
9: Pushdown automata producing an output: basic definitions and properties, applications in practice
10: Context-sensitive languages: context-sensitive grammar, nondeterministic linear-bounded Turing machine (LBA), transforming context-sensitive grammar to an LBA, transforming LBA to a context-sensitive grammar
11: Closure properties of context-sensitive languages
12: Recursively enumerable languages: phrase-structure grammar, nondeterministic and deterministic Turing machine, transforming nondeterministic Turing machine to a phrase-structure grammar, transforming phrase-structure grammar to a deterministic Turing machine, closure properties
13: Universal Turing machine
14: Algorithmically undecidable problems of the formal language theory

Recommended literature:

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

Course language:
Slovak or English

Notes:
Content prerequisities:
1. Basic mathematical background (proof by contradicion and by mathematical induction), basic notions from the set theory (union, intersection, complement, cartesian product).
2. Basic knowledge about finite state automata and regular languages.

Course assessment
Total number of assessed students: 587

A	B	C	D	E	FX
37.82	16.87	19.25	17.38	6.13	2.56

Provides: prof. RNDr. Viliam Geffert, DrSc., Mgr. Alexander Szabari, PhD., RNDr. Juraj Šebej, PhD., RNDr. Dominika Pališínová

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

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

Course assessment
Total number of assessed students: 134

A	B	C	D	E	FX
45.52	28.36	11.94	7.46	6.72	0.0

Provides:

Date of last modification: 28.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KMU1/15	**Course name:** Coding and multimedial data transition
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 1 **Per study period:** 28 / 14 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course: 5., 7.	
Course level: I., II.	
Prerequisities:	
Conditions for course completion: Homeworks, active participation in laboratory exercises, midterm test. Final written exam, oral examination.	
Learning outcomes: Understand the principles of lossy compression algorithms. Be able to apply different methods of quantization, prediction and difference procedures in lossy image and sound compression algorithms. Understand the JPEG and MPEG compression standards.	
Brief outline of the course: 1. Formal model of coding and information transfer, compression ratio, criteria of uniquely decodable codes, block and prefix lossless codes. 2. Coding with known distribution of probabilities of occurrences of input characters, relation to entropy, Huffman construction, adaptive variants. 3. Arithmetic coding, integer, binary, adaptive versions, advantages and disadvantages of statistical codes. 4. Context coding, prediction methods, JBIG, JPEG-LS standards, PPM. 5. Dictionary compression methods, LZ77, LZW, use of transformations, BWT, ACB, dynamic Markov chains. 6. Principles of lossy compression, RD function, probabilistic and physiological models for efficient compression. Uniform and non-uniform scalar quantization, adaptive versions. 7. Vector quantization, optimization according to distribution function, compressors and expanders. 8. Differential techniques, prediction methods, adaptive quantization with prediction, DPCM method, use in audio and video coding. 9. Transformations in lossy coding, orthonormal representations, component analysis, two-dimensional transformations. 10. Discrete Fourier transform, use in image compression, JPEG encoder. 11. Subband filters, signal decomposition, signal synthesis from subbands, use in sound compression, psychoacoustic models, MP3, AAC coding. 12. Wavelet transforms, EZW encoder, use in audio and video coding. 13. Video compression, MPEG standards, adaptive algorithms for streaming and video conferencing.	

Recommended literature:

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

Course language:

Slovak or English

Notes:

Course assessment

Total number of assessed students: 21

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

Provides: doc. RNDr. Jozef Jirásek, PhD.

Date of last modification: 08.01.2022

Approved:

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: 4.

Course level: I.

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: 130

A	B	C	D	E	FX	N	P
30.0	18.46	12.31	15.38	16.92	2.31	0.0	4.62

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved:

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: 5.

Course level: I., 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: 56

A	B	C	D	E	FX
53.57	16.07	16.07	10.71	1.79	1.79

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ UNV1/15	**Course name:** Computational and cognitive neuroscience 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: 5.

Course level: I., 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: 32

A	B	C	D	E	FX
18.75	21.88	25.0	21.88	9.38	3.13

Provides: doc. Ing. Norbert Kopčo, PhD., RNDr. Keerthi Kumar Doreswamy, Ing. Udbhav Singhal, Mgr. Ondrej Spišák

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PSIN/15	**Course name:** Computer network Internet

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2.

Course level: I., N

Prerequisities: ÚINF/PAZ1a/15 or ÚINF/PRG1/15

Conditions for course completion:
Activity at excercises (max 18 points), home work (max 18 points), test (max 30 points).
Verbal exam (min 25 points, max 50 points). Required minimum for passing the course is 55 points.

Learning outcomes:
Students will get the informations about principles and achitecture of Internet. They will understand the principles of ISO/OSI layers reference model for network communication. They will understand the meaning and usage of terms protocol, service, interface. They will analyze the parameters of communication channels, understand the function of interconnection devices (hub, switch, router). They will understand the structure of IP packets, addressing and how packets are transmitted, the principle of routing protocols and the creation of routing tables. They will understand the priciples of acknowledged TCP transport transmission and its implementation. They will know how to use the interface of UDP and TCP protocols in a program code. They will understand the basic application protocols of the Internet.

Brief outline of the course:
1. Introduction to computer networks, internet connection types, delay and loss in packet-switched networks, ISO OSI reference model and TCP/IP protocols family.
2. Application layer: Web and HTTP, protocol FTP ,e-mail and protocols SMTP, POP3, IMAP,
3. Application layer: domain names and DNS, Peer-to-peer applications. Security in computer networks.
4. Transport layer: services, multiplexing and demultiplexing, protocol UDP, reliable data transfer
5. Transport layer: connection oriented transport protocol TCP, flow and congestion control.
6. Network Layer: Internet protocol IPv4, virtual circuit and datagram networks, packet fragmentation, routing table, application protocol DHCP
7. Network Layer: network address translation NAT, ICMP protocol, internet protocol IPv6
8. Network Layer: routing algorithms and protocols, broadcast and multicast routing
9. Link layer: error detection, multiple access methods CSMA/CD and CSMA/CA, Ethernet, frames, protocols ARP and RARP, link layer addressing
10. Link Layer and wireless and mobile networks: hub, switch, virtual LAN, 802.11 Wireless LAN, Bluetooth 802.15, WiMAX 802.16, Mobile IP, mobility in GSM
11. Physical Layer: Communication channels parameters, digital and analog encoding.

Recommended literature:

1. J. F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach, 7. edition, 2016
2. A. S. Tanenbaum: Computer Networks, 5. edition, Pearson, 2010
3. W. Stallings: Local and Metropolitan Area Networks, Prentice Hall, 2000
4. E. Comer, R.E. Droms: Computer Networks and Internets, Prentice Hall, 2003
5. W. R. Stevens: TCP/IP Illustrated, Vol.1: The Protocols, Addison-Wesley, 1994

Course language:

Slovak or English

Notes:

Content prerequisities: basic programming skills in Java

Course assessment

Total number of assessed students: 843

A	B	C	D	E	FX
9.49	5.58	12.46	16.37	36.42	19.69

Provides: RNDr. Peter Gurský, PhD., doc. RNDr. JUDr. Pavol Sokol, PhD.

Date of last modification: 04.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KOPR/19	**Course name:** Concurrent programming

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: 7.

Course level: I.

Prerequisities: ÚINF/PAZ1a/15

Conditions for course completion:
Creation and defense of given final projects. First project in area of parallel programming and the second one in area of distributed programming.

Learning outcomes:
Students will acquire the ability to practically create thread-safe programs, design solutions for cooperation and synchronization of threads, correctly terminate the work of threads, coordinate the thread of the graphical user interface with working threads, to create high-throughput programs based on Reactor's reactive current structures, to create distributed program architectures based on the actor model, coordinate the work of a distributed system through the Message Broker systems RabbitMQ and Apache Kafka and to create and use SOAP web services.

Brief outline of the course:
1, SOAP: From web service to WSDL. JAX-WS 2.0. SoapUI tool.
2, SOAP: From WSDL to Web Service. Creating WSDL in Eclipse. Generating server code.
3, Thread programming: Introduction to threads
4, Thread programming: Race conditions and atomicity of objects state
5, Thread programming: Composition of thread-safe classes
6, Thread programming: Concurrent collections
7, Thread programming: Threads coordination, synchronizers
8, Thread Programming: Executors
9, Thread programming: ForkJoinPool - work stealing design pattern
10, Thread programming: Termination of tasks, threads and executors
11, Thread Programming: Threads in JavaFx
12, Reactive programming: Reactive stream functions
13, Reactive programming: Stream generation, error handling, stream termination
14, Reactive programming: Design of reactive programs, reactive communication with a database
15, Reactive programming: WebFlux - reactive programming on the web
16, Actor model: Design of actors and communication between them
17, Actor model: Actuator scaling, pools and supervision
18, Actor model: Distributed actors, Akka cluster
19, Message Brokers: Basic concepts for RabbitMQ - exchange, queues

20, Message Brokers: RabbitMQ - complex message routing, failover, structured messages, message acknowledgment
21, Message Brokery: Apache Kafka

Recommended literature:

1. GOETZ, Brian. Java concurrency in practice. Upper Saddle River, NJ: Addison-Wesley, c2006. ISBN 9780321349606.
2. HYDE, Paul. Java thread programming. Indianapolis, Ind.: Sams Pub., c1999. ISBN 0672315858.
3. WHITE, Tom. Hadoop: the definitive guide. 3rd ed. Sebastopol: O'Reilly, 2012. ISBN 978-1-449-31152-0.
4. Project Reactor documentation. Available online: <https://projectreactor.io/docs>
5. Project Akka documentation. Available online: <https://akka.io/docs/>
6. Project RabbitMQ documentation. Available online: <https://www.rabbitmq.com/documentation.html>
7. Project Apache Kafka documentation. Available online: <https://kafka.apache.org/documentation/>

Course language:
Slovak

Notes:
Content prerequisites: It is necessary to have mastered the basics of programming in Java in the scope of PAZ1a. There is an advantage if students know the JavaFX framework and Rest API in the range of PAZ1c.

Course assessment
Total number of assessed students: 95

A	B	C	D	E	FX
42.11	27.37	16.84	10.53	3.16	0.0

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

Date of last modification: 04.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ DBS1a/15	**Course name:** Database 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: 3.

Course level: I.

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:
After completing the course, the student acquires the principles of relational databases, is able to apply standard data models, design relational databases and formulate filtering queries.

Brief outline of the course:
1) Relational databases. Query language SQL, filtering.
2) Data types, operators, numerical, string and time functions.
3) JOIN operations.
4) AGGREGATION AND GROUP BY.
5) Data and database models. Relational scheme. RDB principles. Data integrity.
6) DB design, ER diagrams.
7) System commands about DB and tables. Cascading deletion and update.
8) Nested queries. ROLLUP. CASE expression.
9) Three-valued logic. Quantifiers and NOT. Set operations.
10) Data science and knowledge acquisition using R.
11) Data warehouses. Data cube. Pivot table.
12) Normalization of relational databases - 1. Relational algebra.

Recommended literature:
C.J. Date, Database Design and Relational Theory, 2012, O'Reilly Media, Inc., ISBN: 978-1-449-32801-6
J. Murach, Murach's MySQL, 3rd Edition, 2019, Mike Murach & Associates, Inc., ISBN-10: 1943872368
- R. Ramakrishnan, J. Gehrke, Database Management Systems, 2020, McGraw-Hill, ISBN13 9780071231510
- S. Krajčí: Databázové systémy, UPJŠ, 2005

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 910

A	B	C	D	E	FX
11.43	10.0	17.47	22.2	31.98	6.92

Provides: doc. RNDr. Csaba Török, CSc., RNDr. Dávid Varga

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ DBS1b/15	**Course name:** Database 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: 6

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚINF/DBS1a/15

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:
After completing the course, the student will be able to apply more sophisticated techniques of relational databases, theoretical analysis of functional dependencies of attributes and is able to work with non-relational databases.

Brief outline of the course:
1) Introduction to SQL Server. Set operations. Window functions.
2) Stored procedures. System and user functions.
3) Views. CTE, recursion and transitive closure.
4) Transactions. Cursors. Pivoting.
5) Triggers and integrity. Physical organization of data, B-trees and indexes.
6) XML documents and their querying. JSON.
7) Functional dependencies and NF.
8) The latest normal form - ETNF.
9) Big data and NoSQL.
10) MongoDB, CRUD and cursors.
11) Aggregations and indices.
12) Replication and sharding.

Recommended literature:
- Date C.J., Database Design and Relational Theory, O'Reilly, 2012
- I. Ben-Gan, D. Sarka, A. Machanic, K. Farlee, T-SQL Querying, 2015, Microsoft Press, ISBN: 978-0-7356-8504-8
- I. Ben-Gan, T-SQL Fundamentals, Third Edition, 2016, Microsoft Press, ISBN: 978-1-5093-0200-0

- L. Davidson, Pro SQL Server Relational Database Design and Implementation, 2021, Apress, ISBN-13: 978-1-4842-6496-6
- K. Chodorow, MongoDB: The Definitive Guide, O'Reilly, second edition, 2013

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: 762

A	B	C	D	E	FX
9.84	8.53	12.6	24.41	34.51	10.1

Provides: doc. RNDr. Csaba Török, CSc., RNDr. Dávid Varga

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ VMA1/21	**Course name:** Development of mobile applications

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: 6., 8.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Active participation in course chat. Implementing and delivering a complex mobile app and presenting technical approach and implementation in a public demo.

Learning outcomes:
Student is able to develop and deliver mobile apps on Android. She knows platform-specic features and is able to program in Kotlin.

Brief outline of the course:
1. Principles and specifics of mobile app development. IDEs. Activities and widgets. Attributes and event handling.
2. Widget layout for flexible and dynamic user interfaces. Activity lifecycle. Persisting state between activity restarts.
3. List widget. RecyclerView. Multiple activities and passing data between them.
4. ViewModels as a separation between data, view and business logic.
5. Using SQL for persistent data. Connecting widgets and data via viewbinding.
6. Internet communication via REST API. Coroutines for asynchronous code.
7. Layouting apps for tablets and small devices.
8. Permissions. Sending SMS messages. Persisting simple app data via Shared Preferences.
9. Camera and multimedia. Using content providers for system-wide data.
10. Services as a means of long background operations. Notifications.
11. Complex navigation by using Navigator components. Animating transitions between activities.
12. Recyclerview and batch event handling.

Recommended literature:
1. Mark L. Murphy: The Busy Coder's Guide to Android Development. CommonsWare, LLC, 2009. ISBN: 978-0981678009
2. W. Frank Ableson, Robi Sen, Chris King and C. Enrique Ortiz: Android in Action Third Edition. Manning, 2011. ISBN 9781617290503
3. Bill Philips, Christ Stewart, Kristin Marsicano: Android Programming: The Big Nerd Ranch Guide. Big Nerd Ranch Guides. ISBN 978-0134706054

Course language:

Slovak or English

Notes:
Content prerequisities: Java programming skills. Object-oriented programming proficiency. Basic experience in concurrent and thread programming.

Course assessment
Total number of assessed students: 91

A	B	C	D	E	FX
56.04	4.4	14.29	4.4	4.4	16.48

Provides: RNDr. Róbert Novotný, PhD., RNDr. Miroslav Opiela, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ DT1/19	**Course name:** Digital technologies for public administration I.

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 7.

Course level: I.

Prerequisities:

Conditions for course completion:
Conditions for the final evaluation:
Final test (practical)
Conditions for successful completion of the course:
1. Active participation in teaching in accordance with the study regulations and according to the teacher's instructions.
2. Mastering the conditions of the final evaluation in the overall expression at the level of at least 80%.

Learning outcomes:
After graduation, the student will be able to: work with documents, data and store them in various formats, use the built-in options. He will master the basic work with the Internet.

Brief outline of the course:
1.-2. Basic terms: ICT, hardware and common devices, software and common applications, types of software licenses, log on/start and log off/shut down a computer. Work on the computer desktop using icons, windows, customize the basic settings of the operating system, create a simple document and print an output. Files and folders, their philosophy, create and work with hierarchical structure, file management, compression and file recovery. Basic concepts of computer networks, basics of access to them, protecting data and devices, malware. Health and green IT.
3.-6. Word processing.
Create, save, close a document, and work with multiple documents at once. Paste, select, copy, move, delete and search for a specific group of data (text). Format fonts, paragraphs, and create patterns for editing text. Document formatting as a whole, paging, headers, footers, notes, spelling. Creation of tables, pictures and graphic objects in the document and work with them. Insert objects into a document and mail merge. Prepare document for printing, transformation of documents into another environment.
7.-10. Work with data tables.
Create, save, close a table, and work with multiple tables, paste, select, copy, move, delete and retrieve the contents of a table cell. Use the autofill tool/copy handle tool to copy, increment data, formula, function. Format cells - numbers, text. Format the table as a whole, spelling, headers,

footers. Insert objects into a table, automatic creation of diagrams and charts from table data. Prepare document for printing, transformation of documents into another environment.
11.-14. Use of the Internet.
Basic concepts of web browsing, security and safety, basic tools, adjusting basic settings. Create bookmarks and their organization, work with outputs from the web. Search tools for the Web, critical evaluation online information, copyright. Basic concepts of electronic communication: online communities, communication tools, e-mail. E-mail: application settings, sending e-mail, receiving e-mail, working with e-mail folders and distribution lists. Organizing e-mails. Use of electronic calendars.

Recommended literature:
Study materials to prepare for passing the M2, M3, M4 and M7 modules of the ICDL international certificate:
1. http://itakademia.sk/wp-content/uploads/2020/05/M2.pdf
2. http://itakademia.sk/wp-content/uploads/2020/05/M3.pdf
3. http://itakademia.sk/wp-content/uploads/2020/05/M4.pdf
4. http://itakademia.sk/wp-content/uploads/2020/05/M7.pdf
Video webinars for demonstration tests from individual modules:
5. https://portal.ccvapp.upjs.sk/search/ecdl

Course language:
slovak

Notes:
By default, teaching is carried out face to face. If this is not possible (eg due to a pandemic), teaching is provided at a distance through video conferencing programs and LMS.
Preparation for possible completion of modules M2, M3, M4 and M7 of the international ICDL certificate.

Course assessment
Total number of assessed students: 24

abs	n	neabs	z
75.0	0.0	25.0	0.0

Provides: RNDr. Slavka Blichová

Date of last modification: 21.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ DT2/19	**Course name:** Digital technologies for public administration II.

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 8.

Course level: I.

Prerequisities:

Conditions for course completion:
Conditions for the final evaluation:
Final test (practical)
Conditions for successful completion of the course:
1. Active participation in teaching in accordance with the study regulations and according to the teacher's instructions.
2. Mastering the conditions of the final evaluation in the overall expression at the level of at least 80%.

Learning outcomes:
After graduation, the student will be able to:
a) to understand what a database is, how it is organized and how to work with it, to create simple databases and to see its contents in different ways,
b) work with presentations and save them in various file formats, use built-in options such as application helper functions to increase performance,
c) manage advanced work with tables,
d) apply knowledge in the field of information security.

Brief outline of the course:
1.-4. Working with databases.
Starting the database system, the principle of working with it and adjusting the basic settings. Using the database - design of its structure, definition of keys and design of its appearance. Database update. Creation of forms and their use in data management. Selection and sorting of information, formulation of questions. Presentation of selected information - creation of reports.
5.-6. Creating presentations.
Creating a presentation and basic operations in it - copying, moving and deleting texts, graphics and images. Formatting text and text frames. Use of graphics, diagrams, pictures and other objects. Preparation of documents for printing, transformation of documents into another environment. Effects of computer presentation - animation, blending. Presentation management - launch from a specified point, hiding selected transparencies, navigation.
7.-12. Advanced work with tables.

Formatting: Apply advanced formatting options such as conditional formatting, custom number formatting, and advanced worksheet handling. Functions and formulas: use of functions related to logical, statistical, financial and mathematical actions (operations). Graphs: Create graphs and use advanced graph formatting techniques. Analysis: working with tables and lists to analyze, filter and sort data, create and use scenarios. Verification and control: verification and control of the data in the workbook. Increasing labor productivity: using named ranges (areas) of cells, macros and templates. Increasing labor productivity: using link, embed, and import elements to integrate data. Workbook revision: concurrent (online) cooperation when working with workbooks, performing control (revision) of workbooks, application of workbook security elements.
13.-14. Information security.
Basic concepts in the field of information security - data threats, personal security, file security. Protect your computer, responding devices, computer network from malicious software, and unauthorized access. Computer network security - recognize the types of computer networks and connections and understand the specialized concepts of their protection. Principles of safe movement on the Internet and communication on the Internet. Security issues in the field of electronic communications, including electronic mail and real-time communication. Secure data management - proper backup, recovery and secure data disposal.

Recommended literature:
Study materials to prepare for passing the M5, M6, AM4 and M12 modules of the ICDL international certificate:
1. http://itakademia.sk/wp-content/uploads/2020/05/M5.pdf
2. http://itakademia.sk/wp-content/uploads/2020/05/M6.pdf
3. http://itakademia.sk/wp-content/uploads/2020/05/M12.pdf
Video webinars for demonstration tests from individual modules:
4. https://portal.ccvapp.upjs.sk/search/ecdl

Course language:
slovak

Notes:
By default, teaching is carried out face to face. If this is not possible (eg due to a pandemic), teaching is provided at a distance through video conferencing programs and LMS.
Preparation for possible completion of modules M5, M6, AM4 and M12 of the international ICDL certificate.

Course assessment
Total number of assessed students: 14

A	B	C	D	E	FX
42.86	7.14	14.29	0.0	21.43	14.29

Provides: RNDr. Slavka Blichová

Date of last modification: 21.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ DSM3a/10	**Course name:** Discrete mathematics for informaticians

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: I.

Prerequisities:

Conditions for course completion:
Course evaluations consists of small tests (5x2 points), 2 semestral tests (each for 20 points), exam test (for 30 points) and oral exam (for 20 points).
During the semester it is possible to get an additional 10 bonus points for activity on classes or for solving bonus homework, respectively (these points are extra and they do not count to maximum of 100 points).
Evaluation:
100 - 90p: A, 89.5 - 80p: B, 79.5 - 70p: C, 69.5 - 60p: D, 59.5 - 50p: E, 49.5p and less: Fx

Learning outcomes:
To present the basics of combinatorics and their applications in computer science. After successful completion of the course, the student should understand the basic principles of combinatorics, calculating different types of configurations, understand the basic concepts of graph theory and the basic principles of selected graph algorithms, usage of graphs for solving the real life problems.

Brief outline of the course:
Mathematical induction and Dirichlet principle. The sum and the product rule. Permutations, k-permutations, combinations. Selections with repetitions. The inclusion/exclusion principle. Recurrent equations. Introduction to graph theory. Trees and spanning trees. Search algorithms in graphs, shortest path algorithms. Eulerian and Hamiltonian graphs. Planar graphs. Graph colorings.

Recommended literature:
1. S. Jendroľ, P. Mihók: Diskrétna matematika I., UPJŠ Košice 1992
2. J. Nešetřil, J. Matoušek: Kapitoly z diskrétni matematiky
3. E. R. Scheinerman: Mathematics - a discrete introduction, Brooks/Cole Publ. Comp. Pacific Grove 2000.
4. R.P. Grimaldi: Discrete and Computational Mathematics, Addison-Wesley Publ. Co.-Rending 1994.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 313

A	B	C	D	E	FX
7.03	3.19	8.63	17.57	51.12	12.46

Provides: RNDr. Mária Maceková, PhD., Mgr. Daniela Matisová

Date of last modification: 16.04.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: CJP/ PFAJ4/07	**Course name:** English Language of Natural Science

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.

Prerequisities:

Conditions for course completion:
Active participation in class and completed homework assignments. Students are allowed to miss 2 classes at the most
Continuous assessment:
1 credit test taken presumably in weeks 6/7
1 project (quiz on the topic of the student´s field of study) 25% of the continuous assessment
5 LMS quizzes (25% of the continuous assessment)
In order to be admitted to the final exam, a student has to score at least 65 % from the continuous assessment
The exam test results represent 50% of the final grade for the course, continuous assessment results represent the other 50% of the final grade.
The final grade for the course will be calculated as follows:
A 93-100, B 86-92, C 79-85, D 72-78, E 65-71, FX 64 and less.

Learning outcomes:
Enhancement of students' language skills (speaking, writing, reading and listening comprehension) in English for specific and academic purposes and development of students' linguistic competence. Students obtain knowledge of selected phonological, lexical and syntactic aspects of professional English, improve their pragmatic competence - students can effectively use the language for a given purpose, and acquire presentation skills at B2 level (CEFR) with focus on terminology of natural sciences.

Brief outline of the course:
1. Introduction to studying language
2. Selected aspects of scientific language
3. Talking about academic study
4. Discussing science
5. Defining scientific terminology and concepts
6. Expressing cause and effect
7. Describing structures
8. Explaining processes
9. Comparing objects, structures and concepts

10. Talking about problem and solution
11. Referencing authors
12. Giving examples
13. Visual aids and numbers
14. Referencing time and place
Presentation topics related to students´study fields.

Recommended literature:

lms.upjs.sk - e-kurz Odborný anglický jazyk pre prírodné vedy.
Redman, S.: English Vocabulary in Use, Pre-intermetdiate, Intermediate. Cambridge University Press, 2003.
Armer, T.: Cambridge English for Scientists. CUP, 2011.
Wharton J.: Academic Encounters. The Natural World. CUP, 2009.
P. Fitzgerald : English for ICT studies. Garnet Publishing, 2011.
https://worldservice/learningenglish, https://spectator.sme.sk
www.isllibrary.com
linguahouse.com

Course language:

English, level B2 (CEFR)

Notes:

Course assessment

Total number of assessed students: 3056

A	B	C	D	E	FX
38.29	26.18	16.46	9.55	7.46	2.06

Provides: Mgr. Lenka Klimčáková, Mgr. Viktória Mária Slovenská

Date of last modification: 05.02.2023

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ FUN1/21	**Course name:** Functional programming

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 7.

Course level: I.

Prerequisities:

Conditions for course completion:
Evaluation of active participation in exercises and evaluation of homeworks. Work on a semester project.

Learning outcomes:
To learn bases of declarative programming (as complementary method to procedural programming) and basic methods of implementations of functional programming language Haskell.

Brief outline of the course:
1. Introduction to functional programming
2. Types, types of types, type variables
3. Syntax and the most important specifics of the Haskell language
4. Recursion
5. Lists
6. Data analysis 1.
7. Data analysis 2.
8. Data analysis 3.
9. Graphic outputs
10. Functions of higher ranks
11. Creating your own types
12. Monads

Recommended literature:
ABELSON, H. a G. J. SUSSMAN. Structure and interpretation of computer programs. Cambridge: MIT Press, 2002. ISBN 0-262-01153-0.
LIPOVAČA, Miran. Learn you a haskell for great good!: a beginner's guide. San Francisco: No Starch Press, 2011. ISBN 978-1-59327-283-8.
O´SULLIVAN, Bryan, Don STEWART a John GOERZEN. Real world Haskell. Beijing: O ´Reilly, 2008. ISBN 978-0-596-51498-3.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 81

A	B	C	D	E	FX
37.04	16.05	18.52	16.05	12.35	0.0

Provides: doc. RNDr. Ondrej Krídlo, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ GRP/13	**Course name:** GRID computing

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: 3

Recommended semester/trimester of the course: 8.

Course level: I.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 7

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

Provides: RNDr. Martin Vaľa, PhD.

Date of last modification: 30.09.2021

Approved:

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: 5., 7.

Course level: I., II.

Prerequisities:

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

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

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

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

Course language:

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

Notes:

Course assessment
Total number of assessed students: 38

A	B	C	D	E	FX
28.95	21.05	18.42	7.89	23.68	0.0

Provides: doc. Ing. Zoltán Tomori, CSc., RNDr. Miroslav Opiela, PhD.

Date of last modification: 22.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ZIV1/21	**Course name:** Internet of Things

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: 6., 8.

Course level: I.

Prerequisities: ÚINF/PAZ1a/15

Conditions for course completion:
Graded activities: small assignments, final complex project.
Rules to pass the subject: Create the final project matching minimal requirements and write the report. Get at least 50% of points from assignments.

Learning outcomes:
To get an overview in the field of Internet of Things and to understand basic concepts. To get an ability to design and implement particular IoT solutions (connecting sensors and actuators to microcontrollers, inter-device communication, data processing and cloud services).

Brief outline of the course:
1. Introduction to IoT, repetition of physics curriculum covering direct current, voltage divider.
2. Arduino, programming in Arduino IDE, sensors and actuators, basic components connection (button, LED, potentiometer, photoresistor).
3. Serial communication, UART, turtle graphics (Java) in connection with sensors and actuators (Arduino).
4. Digital synchronous and asynchronous communication, SPI, I2C protocol, 7-segment display, I2C expander, buzzer and creating melodies.
5. Sensor data, overview of sensor modules, smartphone sensors, filtering measured values.
6. Application layer protocols (MQTT), overview of IoT protocols.
7. Node-RED, open-data processing, IoT dashboard, connection with Arduino.
8. Raspberry PI, remote access, security in IoT.
9. Cloud computing, AWS services dedicated to IoT.
10. Machine learning, basic overview from the IoT point of view, focus on data preprocessing and evaluation.
11. Existing solutions - projects developed by students and IT companies.

Recommended literature:
1. SELECKÝ, Matúš. Arduino: uživatelská příručka. Přeložil Martin HERODEK. Brno: Computer Press, 2016. ISBN 9788025148402.
2. UPTON, Eben a Gareth HALFACREE. Raspberry Pi: uživatelská příručka. 2., aktualizované vydání. Přeložil Jakub GONER. Brno: Computer Press, 2016. ISBN 9788025148198.
3. MONK, Simon. Programming Arduino, 2. vyd, McGraw-Hill, 2016. ISBN 9781259641633

Course language:
Slovak language. English language is required for accessing AWS and other resources.

Notes:

Course assessment
Total number of assessed students: 64

A	B	C	D	E	FX
68.75	7.81	9.38	7.81	3.13	3.13

Provides: RNDr. Miroslav Opiela, PhD., RNDr. Štefan Bocko

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ UGR1/15	**Course name:** Introduction to computer graphics

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3., 5.

Course level: I., II.

Prerequisities:

Conditions for course completion:

Learning outcomes:
To provide the students with knowledge of graphics algorithms and basic principles of computer graphics.

Brief outline of the course:
Graphics hardware, input and output devices. Color models, palettes. Raster graphics algorithms for drawing 2D primitives. Filling and clipping. Curve modeling, interpolations and approximations, spline forms, Bézier curves, B-splines, surfaces. Homogenous coordinates, affine transformations, perspective and parallel projections. Visible-surface determination, illumination and shading. Rendering techniques, photorealism, textures, ray tracing, radiosity. Object representations, computer animation, virtual reality.

Recommended literature:
FOLEY, J. D., van DAM, A., FEINER, S., HUGHES, J.: Computer Graphics: Principles and Practice, Addison-Wesley, 1991
MORTENSON, M.E.: Geometric modeling, 2.ed., Willey, 1997

Course language:

Notes:

Course assessment
Total number of assessed students: 311

A	B	C	D	E	FX
13.18	10.29	13.83	23.47	30.87	8.36

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ UIB1/21	**Course name:** Introduction to information security
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: 5.	
Course level: I.	
Prerequisities:	
Conditions for course completion: The condition for passing the course is: 1. Exercise tasks (20% of the total number of points), 2. Homeworks (30% of the total number of points), 3. Written final theoretical exam (25% of the total number of points), 4. Written final practical exam (25% of the total number of points).	
Learning outcomes: The result of the education is an understanding of the basic concepts of information security from the technical, legal and procedural views of point.	
Brief outline of the course: 1. Introduction to information security and information security model, 2. Information security management, 3. Risk and risk management, 4. Legal, normative and ethical aspects of information security, 5. Continuity management of activities, processes and security incidents handling, 6. Introduction to cryptology, 7. Access control, 8. Physical and environmental security, 9. Human resources security and social engineering, 10. End point security and malicious code, 11. Computer network security, 12. Application security, 13. Final exam.	
Recommended literature: 1. MARTIN, Andrew, Awais RASHID, Steve SCHNEIDER a Howard CHIVERS. CyBOK: The Cyber Security Body of Knowledge. The National Cyber Security Centre, 2021, 2. ANDRESS, Jason, Awais RASHID, Steve SCHNEIDER a Howard CHIVERS. Foundations of Information Security: A Straightforward Introduction. 1. No Starch Press, 2019. ISBN 978-1718500044, 3. PELTIER, Thomas, Awais RASHID, Steve SCHNEIDER a Howard CHIVERS. Information Security Fundamentals. 2. Boca Raton: Auerbach Publications, 2013. ISBN 978-1138436893.	
Course language: Slovak or English	
Notes:	

Course assessment
Total number of assessed students: 130

A	B	C	D	E	FX
36.92	28.46	20.0	7.69	3.08	3.85

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., MSc. Terézia Mézešová

Date of last modification: 04.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ UNS1/15	**Course name:** Introduction to 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: 3., 5.

Course level: I., II., N

Prerequisities:

Conditions for course completion:
The condition for passing the course is the realization of a project with the application of neural networks, successful completion of two written tests in the field of neural networks, their basic types, and genetic algorithms, as well as successful completion of the written and oral part of the exam.

Learning outcomes:
The result of the education is an understanding of the basic principles of neural networks and genetic algorithms. The student will gain the ability to apply the acquired knowledge in intelligent data analysis and also work with a selected tool for modeling neural networks.

Brief outline of the course:
1. Basic concept arising from biology. Linear threshold units, polynomial threshold units, functions calculable by threshold units.
2. Perceptrons. Linear separable objects, adaptation process (learning), convergence of perceptron learning rule, higher order perceptrons.
3. Forward neural networks, hidden neurons, adaptation process (learning), backpropagation method.
4. Recurrent neural networks. Hopfield neural networks, properties, associative memory model, energy function, learning, optimization problems (business traveler problem).
5. Model of gradually created network. ART network, architecture, operations, initialization phase, recognition phase, search and adaptation phase. Use of the ART network.
6. Applications of studied models in solving practical problems.
7. Written test I.
8. Motivation to model genetic elements. Genetic algorithm. Application of genetic algorithms.
9. Genetic programming, root trees, Read's linear code. Basic stochastic optimization algorithms: blind algorithm and climbing algorithm. Forbidden search method.
10. Genetic and evolutionary programming with typing, examples of use. Grammatical evolution.
11. Special techniques of evolutionary computations. Selection mechanisms in evolutionary algorithms.
12. Use of genetic algorithms in training neural networks. Artificial life.
13. Written test II.

Recommended literature:

1. AGGARWAL, Charu C. Neural networks and deep learning: a textbook. Cham: Springer, 2018. ISBN 978-3319944623.
2. KVASNIČKA, Vladimír. Úvod do teórie neurónových sietí. [Slovenská republika]: IRIS, 1997. ISBN 80-88778-30-1.
3. KVASNIČKA, Vladimír. Evolučné algoritmy. Bratislava: Vydavateľstvo STU, 2000. Edícia vysokoškolských učebníc. ISBN 80-227-1377-5.
4. MITCHEL, Melanie. An Introduction to Genetic Algorithms. Cambridge: MIT Press, 2002. ISBN 0-262-63185-7.
5. SINČÁK, Peter, ANDREJKOVÁ, G. Úvod do neurónových sietí, I. diel, Košice: ELFA, 1996. ISBN 808878638X

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: 472

A	B	C	D	E	FX
17.16	17.58	22.25	17.8	21.19	4.03

Provides: doc. RNDr. Ľubomír Antoni, PhD., RNDr. Šimon Horvát, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ MZI/21	**Course name:** Introduction to study of informatics

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.

Prerequisities:

Conditions for course completion:
Understanding of basic mathematical notions

Learning outcomes:
Understanding of basic mathematical notions

Brief outline of the course:
1. Mathematical text
2. Connections and quantifiers
3. Classes and sets
4. Other operarions operácie
5. Relations
6. Relational algebra
7. Orderings
8. Equivalences
9. Functions
10. Cardinalities
11. Infinities
12. Cardinal arithmetics

Recommended literature:
https://ics.upjs.sk/~krajci/skola/vyucba/jesen/predmety/MZI.html

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 296

A	B	C	D	E	FX
48.65	21.28	8.78	2.7	1.01	17.57

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 23.11.2021
Approved:

COURSE INFORMATION LETTER

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

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 6.

Course level: I., II.

Prerequisities:

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

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

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

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

Course language:
Slovak

Notes:

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

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ZLI/21	**Course name:** Linux basics

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., N

Prerequisities:

Conditions for course completion:
The condition for passing the course is: 1. Homeworks (50% of the total number of points), 2. Written final theoretical exam (25% of the total number of points), 3. Written final practical exam (25% of the total number of points).

Learning outcomes:
The result of the education is an understanding of the theoretical and practical background for studying computer science, by giving the necessary knowledge in the usage of Unix/Linux operating systems.

Brief outline of the course:
1. Introduction to Unix/Linux systems, 2. Linux ommand line, 3. Text processing tools, 4. Managing files, 5. Managing users, groups and rights, 6. Managing processes, 7. Managing software and packages, 8. Administering the system - system booting, jobs, logging,9. Basic networking, 10. Managing network interfaces, 11. Managing disk partitions, 12. Exam.

Recommended literature:
1. LPIC-1 Exam 101. LPI [online]. Canada: The Linux Professional Institute, 2021 [cit. 2021-9-22]. Dostupné z: https://learning.lpi.org/en/learning-materials/101-500/, 2. LPIC-1 Exam 102. LPI [online]. Canada: The Linux Professional Institute, 2021 [cit. 2021-9-22]. Dostupné z: https://learning.lpi.org/en/learning-materials/102-500/, 3. Linux - Dokumentační projekt [online]. 4. Praha: Computer Press, 2007 [cit. 2021-9-22]. Dostupné z: https://i.iinfo.cz/files/root/k/LDP_4.pdf.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 107

A	B	C	D	E	FX
44.86	14.95	17.76	7.48	5.61	9.35

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Richard Staňa
Date of last modification: 04.01.2022
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/LOP1/15	**Course name:** Logic programming

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 4., 8.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Evaluation of active participation in exercises and homework, test of theoretical knowledge during the semester. Written and oral exam together with assessment from exercises.

Learning outcomes:
To learn bases of declarative programming (as complementary method to procedural programming) and basic methods of implementations of logic programming languages.

Brief outline of the course:
1. Introduction to logic
2. theory, models, Herbrand model
3. SLD resolution
4. Basics of Prolog language
5. Prologue in examples
6. Lists
7., 8., 9. Data analysis in Prolog
10., 11., 12. Graph theory in Prolog

Recommended literature:
BRATKO, Ivan. Prolog. Programming for Artificial Intelligence. 2 ed. Wokingham: Addison-Wesley, 1990. ISBN 0-201-41606-9.
NILSON U., MALUSINSKI J.: Logic, Programming and Prolog, John Wiley & Sons Ltd. 1995
NIENHUYIS-CHENG Sh.H., WOLF R.: Foundations of Inductive Logic Programming, Springer-Verlag, 1997

Course language:
Slovak or English

Notes:
Prerequisites: none

Course assessment Total number of assessed students: 307					
A	B	C	D	E	FX
23.78	14.01	14.33	22.8	23.45	1.63
Provides: doc. RNDr. Ondrej Krídlo, PhD.					
Date of last modification: 23.11.2021					
Approved:					

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ MIS/15	**Course name:** Management of information systems

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: 8.

Course level: I.

Prerequisities:

Conditions for course completion:
Completion of the subject is conditional on the completion of partial tasks within the group project during the semester in an appropriate quality. The project is aimed at:
- mastering the basic concepts and methods taught,
- mastering the principles of related IT tools,
- presentation and defense of the created project.

Detailed conditions for evaluating partial tasks and obtaining a final evaluation are published in the AIS.

Learning outcomes:
By completing the subject, students will gain
- knowledge of the general aspects of the design and use of information systems for managing the organisation in relation to the strategic goals of the organisation,
- knowledge of the principles of basic ICT technologies used to manage processes in various areas of the company's functioning,
- basic knowledge and skills on the use of relevant IT tools,
- experience of working in a heterogeneous team and with project presentation.

Brief outline of the course:
1. Introduction to information systems.
2. Organisational strategy and the role of information systems in gaining competitive advantage.
3. Managing data and knowledge.
4. Business Intelligence.
5. Ethics and privacy protection.
6. Information security.
7. Social computing
8. Electronic commerce.
9. Wireless and mobile computing.
10. The role of information systems within the organisation and public administration.
11. CRM systems.
12. Management of supply-customer chains.
13: Procurement and implementation of information systems.

Recommended literature:

1. R. Kelly Rainer, Brad Prince, Hugh J. Watson, Management Information Systems, Wiley 2015, ISBN : 978-1-118-89538-2
2. Voříšek, J.: Strategické řízení informačního systému a systémová integrace, Praha, Management Press, 1999.
3. O'Brien, J., Marakas, G.: Management Information Systems, McGraw-Hill, 2010, ISBN 0073376813.
4. Laudon, K., Traver, C.G.: Management Information Systems: Managing the Digital Firm, Prentice Hall, 2011, ISBN 0132142856.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 39

A	B	C	D	E	FX
35.9	30.77	17.95	10.26	2.56	2.56

Provides: prof. RNDr. Gabriel Semanišin, PhD., RNDr. Richard Staňa

Date of last modification: 25.07.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚMV/ MTIa/21	**Course name:** Mathematics I for informaticians

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.

Course level: I.

Prerequisities:

Conditions for course completion:
Two tests, completion of individual and group homework (including project) during the semester. Assessment is given on the basis of semestral evaluation and examination test.
The ability to solve selected types of problems (without context / with context) also in combination with mathematical software is evaluated. Furthermore, the understanding of concepts and relationships between them (conceptual questions / tasks) is taken into account.
A total of 100 points can be obtained (60 points during the semester and 40 points for the exam test). In addition, it is possible to obtain bonus points for various activities (solving bonus tasks, active approach to the subject during the semester ...).

Learning outcomes:
To obtain basic mathematical knowledge about the divisibility of integers, congruences, number systems, groups, vectors, matrices and determinants, as well as the functions of one real variable.
To get acquainted with the applications (including the information technologies) of some fundamental mathematical concepts. To learn to work with mathematical software and together with the acquired knowledge to use it in solving various types of problems.

Brief outline of the course:
Introduction to the teaching system, technologies and mathematical software (1 week).
Integers and divisibility, prime numbers and congruences, applications of congruences and residue classes - basic properties of integer divisibility, canonical decomposition of a number, greatest common divisor and least common multiple of numbers, Euclidean algorithm, solution of (linear) Diophantine equations and (linear) congruences, addition and subtraction of residue classes (3 weeks).
Number systems and conversions between them - positional number systems and conversions between them, arithmetic operations in different number systems (1 week).
Vectors, matrices, determinants, their applications and introduction to analytical geometry - vector and matrix operations, scalar and vector product, angles of vectors, calculation of matrix determinants (from definition, Saruss rule, row/column expansion), inverse matrix determination (using determinant and adjoint matrix, Gaussian-Jordan method), solution of linear systems equations (Gaussian elimination method, Cramer's rule, substitution/addition method), eigenvalues/

eigenvectors of a matrix, analytical expressions of a line/plane/circle/sphere - determination of their mutual position and angles (3 weeks).
Introduction to (elementary) functions - domains and graphs of functions, basic properties of functions (boundedness, monotonicity, parity, periodicity), operations with functions, inverse function, basic properties of elementary functions (polynomial, power, exponential, logarithmic, trigonometric, cyclometric) (2 weeks).
Groups, fields - binary operation, group definition, Cayley's table, Latin squares, group isomorphism, subgroup, cyclic (sub) group, group order, element order, Cayley's theorem, Lagrange's theorem, field definition (1 week).

Recommended literature:

Hallet D. H. (2014). Applied Calculus. John Wiley & Sons.
Koshy T. (2007). Elementary Number Theory with Applications. Elsevier.
Judson T. W., Austin S. F. (2019). Abstract Algebra: Theory and Applications. GNU Free Documentation License.
Lay D. C. (2012). Linear Algebra And Its Applications. Boston: Addison-Wesley.
Studenovská D., Madaras T. (2006). Matematika pre nematematické odbory. UPJŠ.
Studenovská D., Madaras T., Mockovciak S. (2006). Zbierka úloh z matematiky pre nematematické odbory. UPJŠ.
Zimmermann P. et al. (2018). Computational Mathematics with SageMath. Springer.

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 232

A	B	C	D	E	FX
2.16	8.62	9.91	21.55	45.26	12.5

Provides: RNDr. Andrej Gajdoš, PhD.

Date of last modification: 30.04.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ MTIb/21	**Course name:** Mathematics II for informaticians

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: 2.

Course level: I.

Prerequisities:

Conditions for course completion:
Two tests, completion of individual and group homework during the semester. Assessment is given on the basis of semestral evaluation and examination test.
The ability to solve selected types of problems (without context / with context) also in combination with mathematical software is evaluated. Furthermore, the understanding of concepts and relationships between them (conceptual questions / tasks) is taken into account.
A total of 100 points can be obtained (60 points during the semester and 40 points for the exam test). In addition, it is possible to obtain bonus points for various activities (solving bonus tasks, active approach to the subject during the semester ...).

Learning outcomes:
Gain basic knowledge of differential and integral calculus of functions of one real variable. Also get acquainted with numerical sequences, infinite numerical series and with the functions of several (mostly two) variables.

Brief outline of the course:
Differential calculus of functions of one real variable - limits and continuity of functions, derivatives of functions, applications of derivatives of functions (4 weeks).
Numerical sequences and infinite numerical series - limits of numerical sequences, geometric series, harmonic series, convergence criteria for infinite series with non-negative terms, infinite series with alternating signs (1 week).
Integral calculus of functions of one real variable - primitive function, substitution method, per partes, applications of a definite integral, improper integrals (3 weeks).
Functions of several (two) variables - domains and visualization, function limits, partial derivatives, determination of (local) extremes of functions (3 weeks).

Recommended literature:
Boelkins M., Austin D., Schlicker S. (2018). Active Calculus. 978-1085940856.
Hallet D. H. et al. (2012). Calculus: Single & Multivariable Variable. Wiley.
Hallet D. H. (2014). Applied Calculus. John Wiley & Sons.
Hallet D. H. et al. (2017). Calculus: Single Variable. Wiley.
Hartman G. et al. (2018). APEX Calculus. 978-1514225158.
Schlicker S., Austin D., Boelkins M. (2018). Active Calculus - Multivariable. 978-1548655525.

D. Studenovská, T. Madaras, S. Mockovčiak: Zbierka úloh z matematiky pre nematematické odbory, UPJŠ 2006
D. Studenovská, T. Madaras: Matematika pre nematematické odbory, UPJŠ 2006

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 150

A	B	C	D	E	FX
4.0	10.67	10.0	25.33	44.0	6.0

Provides: RNDr. Andrej Gajdoš, PhD.

Date of last modification: 30.04.2022

Approved:

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: 8.

Course level: I., II.

Prerequisities:

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

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

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

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

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

Course language:
Slovak or English.

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

Course assessment
Total number of assessed students: 155

A	B	C	D	E	FX
16.13	19.35	25.16	20.65	17.42	1.29

Provides: doc. RNDr. Csaba Török, CSc.

Date of last modification: 23.11.2021

Approved:

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: 7.

Course level: I., II.

Prerequisities:

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

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

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

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

Recommended literature:

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

Course language:

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

Notes:

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

Course assessment

Total number of assessed students: 94

A	B	C	D	E	FX
68.09	19.15	7.45	2.13	3.19	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 22.11.2021

Approved:

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: 8.

Course level: I., II.

Prerequisities:

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

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

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

Recommended literature:
The actual scientific papers.

Course language:

Notes:

Course assessment
Total number of assessed students: 55

A	B	C	D	E	FX
87.27	5.45	5.45	1.82	0.0	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 08.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NUM/10	**Course name:** Numerical Methods

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., 5.

Course level: I.

Prerequisities:

Conditions for course completion:
To successfully complete the course, the student must demonstrate a sufficient degree of understanding and ability to apply the basic numerical methods of mathematical analysis and algebra, which are necessary for subsequent courses in computational physics. The basis of evaluation is participation and activity in exercises and work on assignments. The condition for obtaining credits is passing 2 written tests at seminars and submitting 4 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 acquaint students with the basic numerical methods of mathematical analysis and algebra needed for the next course of computational physics. The student will learn to approximate and interpolate functions, solve systems of linear and nonlinear equations, numerically derive and integrate or determine eigenvalues and eigenvectors of matrices.

Brief outline of the course:
1. Computational solution of problems and errors of numerical solution.
2. Approximation of functions.
3. Interpolation of functions.
4. Approximation by trigonometric polynomials. Fast Fourier analysis.
5. Solution of nonlinear equations, convergence conditions and error estimation of the methods.
6. Numerical methods for solving nonlinear equations.
7. Solution of systems of linear equations - direct methods.
8. Solution of systems of linear equations - iterative methods.
9. Numerical integration (quadrature) of functions.
10. Numerical differentiation of functions.
11. Eigenvalues and eigenvectors of a matrix - partial problem.
12. The complete problem of eigenvalues.

Recommended literature:

Basic literature:
POZRIKIDIS, C.: Numerical Computation in Science and Engineering, Oxford University Press, 2008.
Other literature:
HAMMING, R.W.: Numerical Methods for Scientists and Engineers, Dover, 1973.
GARCIA, A.L.: Numerical Methods for Physics, Prentice-Hall, 1994.

Course language:

Notes:

Course assessment
Total number of assessed students: 164

A	B	C	D	E	FX
14.63	15.85	23.17	24.39	17.68	4.27

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/OSY1/21	**Course name:** Operating systems

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: I.

Prerequisities:

Conditions for course completion:
Oral exam

Learning outcomes:
Student obtains base knowledge about the properties and internal processes of operating systems, their structure and concept. By completing the course, the student will gain a comprehensive picture of the life cycle of processes, their planning and communication between them. He will also gets a knowledge of physical, logical and virtual memory management and understands synchronization as well as phenomena such as deadlocks or starvation. The acquired knowledge will enable the student to understand the behavior of the operating system, which leads to gaining the ability to intervene with running operating system, eventually optimize it.

Brief outline of the course:
1. History, development, user interface and structure of operating systems.
2. Kernel of the operating system and system calls, implementation.
3. Process - definition, structure, life cycle, implementation.
4. Process - planning algorithms, multiprocessing.
5. Process - inter-process communication.
6. Thread - definition, structure, life cycle, implementation.
7. Synchronization of processes and system resources.
8. Deadlock and starvation - prevention, detection, recovery.
9. Memory - definition, types of memories, usage, volatility, DMA.
10. Memory - allocation strategies, paging, fragmentation.
11. Memory - MMU, TLB, MPU, segmentation.
12. Memory - virtual memory management strategies.
13. File system - definition, structure, implementation.
14. File system - file, directory, attributes, access control, ACL.

Recommended literature:
1. SILBERSCHATZ, Abraham, Peter B. GALVIN a Greg GAGNE. Operating System Concepts. 10th Revised edition. New York, United States: John Wiley, 2021. ISBN 9781119800361.
2. TANENBAUM, Andrew, Herbert BOS. Modern Operating Systems. 4th edition. London, UK: Pearson Education Limited, 2014. ISBN 9781292061429.

3. The Linux Kernel documentation. Linux Kernel Library [online]. Dostupné z: https://www.kernel.org/doc/html/latest/
4. DOWNEY, Allen B. The Little Book of Semaphores [online]. Version 2.2.1. Green Tea Press, 2016. Dostupné z: https://greenteapress.com/semaphores/LittleBookOfSemaphores.pdf

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 185

A	B	C	D	E	FX
23.24	22.16	19.46	23.78	9.73	1.62

Provides: RNDr. PhDr. Peter Pisarčík

Date of last modification: 08.10.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PDS2/21	**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: 6.

Course level: I.

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: 36

A	B	C	D	E	FX
22.22	5.56	13.89	11.11	27.78	19.44

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

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ LEK1/99	**Course name:** Physical Principles of Medicine Technique

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: 7.

Course level: I.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 41

A	B	C	D	E	FX
87.8	9.76	2.44	0.0	0.0	0.0

Provides: doc. RNDr. Karol Flachbart, DrSc.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PRP2/15	**Course name:** Principles of computers

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: I.

Prerequisities:

Conditions for course completion:
Graded activities: assignments, mid semester exam, final exam

Learning outcomes:
- Know brief history of computer, classification and construction principles of computers of von Neumann type.
- Understand relation between real numbers, integers and their binary representation as well as be able to perform basic arithmetic and logic operations over binary represented numbers.
- Learn basics about logic gates, combination and sequence circuits and their structure. Understand principles of how basic circuits realize arithmetic-logic unit and other parts of computers e.g. memory.
- Know principles of communication of processor and other devices via interruptions and direct memory access.
- Get idea of device drivers, device controllers and their functionality.

Brief outline of the course:
1. Computers of von Neumannovho type, brief history of computer science.
2. Encoding of integers, real numbers and arithmetic operations. Encoding of symbols.
3. Logic functions and their realization and optimisation.
4. Combination circuits. Realization of basic functional and control elements on computer circuits.
5. Arithmetic logic unit ant its realization.
6. Sequential circuits, memory cell, organization of memory matrix, types of memories.
7. Machine cycle.
8. Types of instruction and instructions sets.
9. Instruction cycle and processing of instructions.
10. Memory and memory subsistem.
11. Communication between processor and peripheral devices. Input output devices, mechanism of interruption in computer, direct memory access. Functionality of device drivers. Device controllers and functionality.
12. Portability of programs. External and peripheral memories their principles and their use. Graphical adapters, monitors, printers, digital scanners.

Recommended literature:

1. STALLINGS, William. Computer Organization and Architecture. Prentice Hall, 2002. ISBN 978-0-13-410161-3.
2. DEMBOWSKI, Klaus. Mistrovství v hardware. Computer Press, 2009. ISBN 978-80-251-2310-2.
3. MINASI, Mark. Velký průvodce hardwarem. Grada, 2002. ISBN 978-80-251-2310-2.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 301

A	B	C	D	E	FX
28.57	16.28	15.61	12.62	22.26	4.65

Provides: RNDr. Juraj Šebej, PhD.

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PBS/15	**Course name:** Pro-seminar to bachelor thesis

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

Number of ECTS credits: 1

Recommended semester/trimester of the course: 6.

Course level: I.

Prerequisities:

Conditions for course completion:
Creating a website about a bachelor's thesis. Selection of bachelor thesis topic. Presentation of the bachelor's thesis assignment and its objectives. Preparation of an essay in the extent of 1 page on the motivation to select a bachelor's thesis. Creation of the bachelor's thesis assignment and its insertion into the AIS by the thesis supervisor.

Learning outcomes:
Basic knowledge of the principles of creation and structure of bachelor's theses. Criteria and requirements for selecting an appropriate bachelor thesis topic. Knowledge about the structure of the bachelor's thesis assignment.

Brief outline of the course:
1. Principles in creating a final thesis.
2. The presentations of bachelor thesis topics by potential supervisors.
3. The presentations of bachelor thesis topics by potential supervisors.
4. The presentations of bachelor thesis topics by potential supervisors.
5. Bachelor thesis and its objectives.
6. Assignment of bachelor thesis.
7. Basic types of bachelor theses.
8. Structure of different types of bachelor theses.
9. Requirements for final bachelor theses.
10. External company final theses.
11. Presentation of selected topics of final theses.
12. Presentation of selected topics of final theses.
13. Presentation of selected topics of final theses.

Recommended literature:
1. STN 01 6910. Rules of writing and editing documents. 2011.
2. STN ISO 2145. Documentation. Numbering of sections and subsections of written documents. 1997.
3. STN ISO 690. Information and documentation. Instructions for creating bibliographic references to information sources and their citation. 2012
4. KATUŠČÁK, Daniel. How to write final and qualification theses. Enigma, 2013

5. Scientific literature related to the topic of the final thesis according to the recommendation of the thesis supervisor.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 344

abs	n
94.77	5.23

Provides: doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PMO1/15	**Course name:** Proces 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: 5

Recommended semester/trimester of the course: 4., 8.

Course level: I., N

Prerequisities: ÚINF/PAZ1b/15 and ÚINF/DBS1a/15 and ÚINF/SWI1a/15

Conditions for course completion:
The interim evaluation is based on the evaluation of partial tasks within the solution of the semester project.
The final assessment is given on the basis of the interim assessment and the result of the exam. On the exam, it is required to prove the ability to orient oneself in the presented issue, to master the theoretical foundations of process modeling, basic skills for the creation and interpretation of process models.
The evaluation is awarded if the student gets at least 50% of the possible points from each part of the exam. Detailed requirements are given in the AIS.

Learning outcomes:
By completing the subject, the student:
- acquires knowledge about the theoretical starting points and basics of process modeling,
- can master the basic principles of creating process models
- get familiar with standard languages for process modeling
- will gain practical experience in creating models using selected modeling tools.

Brief outline of the course:
1. Introduction to process modeling.
2. Development of approaches to the development of large software systems.
3. Theoretical foundations of process modeling.
4. Petri nets.
5. Process orchestration.
6. Choreography of processes.
7. Selected properties of processes and process models.
8. Architectures of process models.
9. Methodologies and standards.

Recommended literature:
1. Ehrig, H.; Juhas, G.; Padberg, J.; Rozenberg, G. (Eds.), Advances in Petri Nets, Lecture Notes in Computer Science , Vol. 2128 (2001)

2. Eshuis, R. ; Wieringa R.: Comparing Petri Net and Activity Diagram Variants for Workflow Modelling – A Quest for Reactive Petri Nets, [dostupné online http://is.tm.tue.nl/staff/heshuis/pnt.pdf]
3. Madison D., Process Mapping, Process Improvement and Process Management, Paton Press 2005
4. Weske, M. Business Process Management, Springer 2007
5. White S.A., Miers D., Fischer L., BPMN Modeling and Reference Guide, Future Strategies Inc., Lighthouse Pt 2008
6. White:, S.A. Process Modeling Notations and Workflow Patterns, [available online http://www.omg.org/bp-corner/bp-files/Process_Modeling_Notations.pdf]

Course language:
Slovak or English

Notes:
Content prerequisities: programming, bases of software engineering and database management systems, bases of project management

Course assessment
Total number of assessed students: 54

A	B	C	D	E	FX
16.67	24.07	27.78	18.52	7.41	5.56

Provides: prof. RNDr. Gabriel Semanišin, PhD.

Date of last modification: 25.07.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/OP/14	**Course name:** Professional experience

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 7.

Course level: I.

Prerequisities:

Conditions for course completion:
Prior to the realization of the internship, the schedule need to be approved by the administrator of the subject from university. After completing the internship, the student submits attendance at the internship, a positive evaluation of the internship written by responsible person from the institution, where the internship was performed and student's own final report from the internship, where he/she describes the activities performed together with acquired knowledge and experience.

Learning outcomes:
Within the professional practice, the student gets acquainted with the institution, its main tasks, organizational structure, processes and basic software used. Student gains experience through practice on some processes in the host institution.

Brief outline of the course:
Student completes 10 days of professional practice in institutions that are focused on development, implementation or testing of software or related focused companies. The selection of an appropriate institution will take place in accordance with the focus of the student within the bachelor's study. The internship normally takes place over a period of 2 weeks during the examination period, or 1 to 2 days per week during the semester or examination period.

Recommended literature:
The student works with resources and literature that are specified by the host institution.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 20

abs	n
100.0	0.0

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 12.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/JAC1/15	**Course name:** Programming language C

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: 5., 7.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Practics attendance and activity. Home assigment
Final project.

Learning outcomes:
The student will gain the ability to create source code files in the C programming language, which is the primary system programming language used in the creation of operating systems and system components, as well as firmware for embedded devices. The aim of the exercise is to guide students from the simple language constructs to a full understanding of working with pointers and their use in the management of static and dynamic memory.

Brief outline of the course:
1. Short overview of language history, explanation of terms, code compilation, linking and program execution.
2. Variables and data types, unary, binary and ternary operations, operator precedence.
3. Cycles, conditions. Structures, unions and enumerators.
4. Functions.
5. Pointers - concept, implementation, pointer arithmetic.
6. Fields - principle, implementation.
7. Dynamic memory allocation.
8. N-dimensional fields and pointers.
9. Text strings.
10. Input and output, command line arguments, process return codes.
11. Dynamic fields and structures.
12. Basic operations with regular files.
13. Pointer to a function.
14. Compiling a program from source code using the "make" utility.

Recommended literature:
1. KERNIGHAN, Brian W., Dennis M. RITCHIE. Programovací jazyk C. Brno: Computer Press, 2006. ISBN:802510897X.
2. PRATA, Stephen. C Primer Plus. 6th Edition. Addison-Wesley Professional, 2014. ISBN 9780321928429.

3. SEACORD, Robert C. Effective C: An Introduction to Professional C Programming. San Francisco, United States: No Starch Press, 2020. ISBN 9781718501041.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 250

A	B	C	D	E	FX
37.2	18.8	15.2	15.2	9.6	4.0

Provides: RNDr. PhDr. Peter Pisarčík, Mgr. Patrik Pekarčík

Date of last modification: 08.10.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PSW1/06	**Course name:** Programming of web-pages

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.

Prerequisities: (ÚINF/DBS1a/15 or ÚINF/DBS/15) and (ÚINF/PAZ1a/15 or ÚINF/PRG1/15)

Conditions for course completion:
50% of the marks from continuous assignments

Learning outcomes:
An overview of modern technologies for creating dynamic websites. Describing and appliyng the basic principles of creating dynamic web pages. Utilize client-side (JavaScript) and server-side (PHP) web programming technologies. Using relational databases (MySQL) to create application web pages. Know the security risks of dynamic websites and be able to eliminate them.

Brief outline of the course:
1. JavaScript - introduction to JavaScript programming.
2. JavaScript - communication with the user, validation of data in forms using JavaScript.
3. JavaScript - introduction to using the jQuery library.
4. PHP - introduction to PHP programming.
5. PHP - data and control structures of the PHP language.
6. PHP - communication with the user, validation of data in forms using PHP.
7. PHP - object oriented problem solving in PHP language. File manipulation.
8. PHP - User authentication (cookies, session).
9. MySQL - introduction to working with MySQL database system.
10. MySQL - Simple applications using the database for data storage and access.
11. Web application security - an introduction to web application security.
12. Web application security - the most common web application security problems and how to eliminate them.

Recommended literature:
BLUM, Richard. PHP, MySQL& JavaScript: All-in-One. Hoboken, New Jersey: John Wiley, 2018. ISBN 978-1-119-46838-7.
KROMANN, Frank M. Beginning PHP and MySQL: From Novice to Professional. 5. CA, USA: Apress, 2018. ISBN 978-1-4302-6043-1.
HUSEBY, Sverre H. Zranitelný kód. Brno: Computer Press, 2006, 207 s. ISBN 80-251-1180-6.
SNYDER, Chris, Thomas MYER a Michael SOUTHWELL. Pro PHP Security: From Application Security Principles to the Implementation of XSS Defenses. 2. United States of America: Apress, 2010. ISBN 978-1-4302-3318-3.

Course language:
Slovak language, knowledge of English language is only necessary for reading documentation.

Notes:
Content prerequisite: WBdi/15 Web and user interface design

Course assessment
Total number of assessed students: 24

abs	n	neabs	z
66.67	33.33	0.0	0.0

Provides: PaedDr. Ján Guniš, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PAZ1a/15	**Course name:** Programming, algorithms, and complexity

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 4 **Per study period:** 42 / 56
Course method: present

Number of ECTS credits: 8

Recommended semester/trimester of the course: 1.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Graded activities during semester: assignments, small exams, midterm, final project.
Final examination: practical finalterm focused on a complex task.
Rules to pass the subject: Pass the minimal limit of points for category of homeworks (assignments, final project) and tests (small exams, midterm). Get at least 42% from the finalterm and pass the defined limit of total points for all graded activities.

Learning outcomes:
Get an ability to implement basic Java programs and obtain essential knowledge related to object-oriented programming.

Brief outline of the course:
1. Introduction to Java and JPAZ2 framework, first Eclipse project, interactive communication with objects using turtle graphics, repeating code in loops, notion of class, object, and method.
2. For-loops, local variables, variable types, arithmetic expressions, random numbers, random walk, conditions.
3. While-loop, returning a value from a method, reference and reference variables, debugging.
4. Primitive and reference types, chars, String objects (including basic algorithms), mouse events, instance variables.
5. Array of primitive values and array of references, simple array algorithms.
6. Advanced array algorithms, two-dimensional array.
7. Exceptions and exception handling, files and directories, writing to text files.
8. Reading from text files.
9. Creating classes, encapsulation, getters and setters, constructors and their hierarchy, method overloading.
10. Inheritance and polymorphism.
11. Java Collections Framework, ArrayList class, wrapper classes for primitive types and autoboxing, interfaces List, Set, Map and their implementations, methods equals and hashCode.
12. Access modifiers, abstract classes and methods, creating and implementing interfaces, sorting, static methods and variables.
13. Creating and throwing exceptions, checked and runtime exceptions, JavaDoc, Maven.

Recommended literature:

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

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

Notes:

Course assessment
Total number of assessed students: 836

A	B	C	D	E	FX
16.03	8.49	11.24	17.34	14.0	32.89

Provides: RNDr. Juraj Šebej, PhD., RNDr. Miroslav Opiela, PhD., Bc. Antónia Matisová, RNDr. Zoltán Szoplák

Date of last modification: 04.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PAZ1b/15	**Course name:** Programming, algorithms, and complexity

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 4 **Per study period:** 28 / 56
Course method: present

Number of ECTS credits: 7

Recommended semester/trimester of the course: 2.

Course level: I., II.

Prerequisities: ÚINF/PAZ1a/15

Conditions for course completion:
Graded activities during semester: assignments, small theoretical exams, practical and theoretical midterm.
Final examination: practical and theoretical finalterm.
Rules to pass the subject: Get at least 50% from theoretical activities (small exams, theoretical midterm and theoretical finalterm) and from practical activities (practical midterm and finalterm). Pass the defined limit of total points for all graded activities.

Learning outcomes:
To know essential algorithms, data structures, and methods used for efficient algorithms design. To understand time complexity analysis. To practice efficient implementation of algorithms. To recognize combinatorial and graph algorithms.

Brief outline of the course:
1. Recursion and fractals.
2. Binary search, basic sorting algorithms, time complexity analysis, O-notation.
3. Basic data structures and algorithms: linked list, stack, queue.
4. Trees and their applications.
5. Efficient sorting algorithms (QuickSort, MergeSort, HeapSort).
6. Backtracking.
7. Dynamic programming, divide and conquer strategy.
8. Unweighted graphs, graph traversal, graph topological sort.
9. Weighted graphs, the shortest path algorithms.
10. Minimum spanning tree, greedy algorithms.
11. Hashing, amortized time complexity, string-searching algorithms.

Recommended literature:
1. WRÓBLEWSKI, Piotr. Algoritmy: datové struktury a programovací techniky. Brno: Computer Press, 2004. ISBN 80-251-0343-9.
2. CORMEN, Thomas H. Introduction to algorithms. 3rd ed. Cambridge: MIT Press, c2009. ISBN 978-0-262-03384-8.
3. KLEINBERG, Jon a Éva TARDOS. Algorithm design. Thirteenth impression. Noida, India: Pearson, c2014. ISBN 9789332518643.

4. MAREŠ, Martin a Tomáš VALLA. Průvodce labyrintem algoritmů. Praha: CZ.NIC, z.s.p.o., 2017. CZ.NIC. ISBN 978-80-88168-19-5.

Course language:
Slovak language, literature is available in english and czech language.

Notes:

Course assessment
Total number of assessed students: 1303

A	B	C	D	E	FX
14.27	7.6	10.74	18.88	20.95	27.55

Provides: RNDr. Juraj Šebej, PhD., RNDr. Miroslav Opiela, PhD., Mgr. Viktor Pristaš, RNDr. Šimon Horvát, PhD., RNDr. Zoltán Szoplák

Date of last modification: 04.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PAZ1c/17	**Course name:** Programming, algorithms, and complexity

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3., 5.

Course level: I., II.

Prerequisities: ÚINF/PAZ1a/15

Conditions for course completion:
Conditions for continuous evaulation: Active participation in exercises.
Conditions for the final evaluation: Implementation and presentation of one or two team projects with sufficient score. Criteria for obtaining points are listed on the course page https://paz1c.ics.upjs.sk/

Learning outcomes:
Ability to design and implement more complex applications with a three-tier architecture, relational database and standard design patterns. The ability to create a REST server in the Spring boot framework and a simple Angular application that can communicate with this server.

Brief outline of the course:
1. Identification of Classes, Methods and Instance Variables, Entities, Unit Tests and JUnit.
2. Introduction to JavaFX, FXML, Scene Builder, Controller.
3. Model-View-Controller design pattern, Observable and Property classes, model of JavaFx models, persistent layer, entities and identifiers, CRUD in-memory storage, GUI and persistent layer interconnection.
4. Design of interfaces for DAO objects. Advantages and disadvantages of associations between classes against manually wired associations. Implementation of the Factory design pattern as an abstraction of wired classes. Enum. Database persistent layer. JDBCTemplate configuration, RowMapper.
5. Data input via JDBCTemplate. Associations between classes. Relationships with cardinalities: 1:1, 1:M, M:N. RDB design and implementation in code. Design of a more complex data model, ResultSetExtractor.
6. Business layer, three-tier application, modal windows, entity modification in JavaFX and MySQL.
7. Logging - System.out.println as the easiest way to log. Logging with Slf4j. Secure password storage.
8. Annotations, work with lambda expressions, generic classes.
9. Spring Boot and REST services. Json format.
10. Angular - installation, TypeScript, DOM model, components and their properties, event capture in components.

11. Angular - communication between components, forms, input validation.
12. Angular - services, Observable, injection, communication with REST server via HTTP.

Recommended literature:

1. WALLS Craig. Spring in Action. Manning Publications; 5th edition, 2018. ISBN 978-1-617-29494-5.
2. ECKEL, B. Thinking in Java. ľPearson; 4th edition,2006. ISBN 0131872486.
3. Website of framework Angular. Available online: <https://angular.io/>

Course language:
Slovak

Notes:
Content prerequisites: basic programming in Java

Course assessment
Total number of assessed students: 147

A	B	C	D	E	FX
24.49	9.52	12.93	27.89	21.77	3.4

Provides: RNDr. Peter Gurský, PhD.

Date of last modification: 04.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PRO1a/15	**Course name:** Project I.
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 4 **Per study period:** 56 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course: 4., 6.	
Course level: I., N	
Prerequisities:	
Conditions for course completion:	
Learning outcomes: Practical skills in full-stack technologies on the backend-frontend principle for REST API, databases and SPA frontend.	
Brief outline of the course: 1. Creation of project documentation using Markdown and Asciidoc 2. Versioning of source codes via git and the GitLab platform 3. Continuous integration and delivery (CI/CD) via GitLab Pipelines 4. Database migration scripts and deployment to production 5. Securing the backend REST API using HTTP Basic (Spring Boot and Spring Security) 6. Securing the backend REST API using OAuth via an authorization server (Keycloak) 7. Application containerization via Docker 8. Custom docker image and integration into CI/CD 9. Testing applications via Testcontainers 10. Frontend and backend integration via API Gateway and loadbalancer (Traefik)	
Recommended literature: 1. Study literature tied to the selected project (according to the client's recommendation) 2. Joost Evertse. Mastering GitLab 12: Implement DevOps culture and repository management solutions. Packt Publishing Ltd, 2019. ISBN 1789534062 3. Lauren#iu Spilcă. Spring Security in Action. Manning, október 2020. ISBN 9781617297731 4. Thomas Vitale. Cloud Native Spring in Action. Manning, november 2022. ISBN 9781617298424 5. Jeff Nickoloff, Stephen Kuenzli. Docker in Action, Second Edition. Manning, október 2019. ISBN 9781617294761	
Course language: Slovak or English	
Notes: content prerequisities: programming skills, basics of shell scripts in Linux	

Course assessment
Total number of assessed students: 125

A	B	C	D	E	FX
69.6	9.6	7.2	9.6	3.2	0.8

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

Date of last modification: 25.11.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PRO1b/15	**Course name:** Project II.

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 5., 7.

Course level: I., N

Prerequisities:

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

Learning outcomes:
Acquire the way of working on the software work with agile methodology, communication in the software team, solving problems of computer systems administration in all phases of their life cycle.

Brief outline of the course:
Work in a 4-5 member team on the development, testing of a software product under the guidance of a mentor from software companies. Improving with continuous integration and working with git in command lines. Software development using Agile methodology.
1. Introduction to the Software Project, team building.
2. Presentation of projects and assignment of Projects to individual teams.
3. CI / CD Pipeline
4. JUnit Tests
5. Selenium Tests
6. Presentation of the current state of the projects
7. Presentation of the current state of the projects
8. Stress tests
9. Presentation of new technologies from the project
10. Presentation of new technologies from the project
11. Presentation of the final project.
12. Presentation of the final project.

Recommended literature:
1. https://www.udemy.com/course/ Git & GitHub - The Complete Git & GitHub
2. https://www.jenkins.io/doc/
3. Study literature tied to the selected project (according to the client's recommendation)
4. "What is Agile Software Development?". Agile Alliance. 8 June 2013. Retrieved 4 April 2015.

Course language:
Slovak or english

Notes:
Content prerequisities:
advanced programming skills

Course assessment
Total number of assessed students: 89

A	B	C	D	E	FX
57.3	15.73	8.99	8.99	3.37	5.62

Provides: Mgr. Alexander Szabari, PhD., RNDr. Róbert Novotný, PhD., Mgr. Patrik Pekarčík

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ PRM1/15	**Course name:** Project management

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: I., N

Prerequisities:

Conditions for course completion:
The ongoing evaluation consists of the evaluation of the sub-tasks related to the project design. The final evaluation is based on a written and oral exam. The result of the ongoing evaluation will also be included in the overall evaluation.

Learning outcomes:
Gain basic knowledge and skills related to project preparation, project mplementation and project evaluation. Acquire basic knowledge of project team management and organization.

Brief outline of the course:
1. Introduction to project management.
2. Project planning. Preparation of project documentation.
3. Project specification.
4. Estimating project Time and Costs.
5. Work organization.
6. Monitoring and project control.
7. Project closure.
8. Project management models.
9. Estimating project times and costs.
10. Project documentation.
11. Specific approaches for projects in the field computer science.
12. Prince2

Recommended literature:
1. BERKUN, S. The Art Of Project Management. O Reilly, 2005.
2. Erik Larson and Clifford Gray : Project Management:
3. PRINCE2. Avaliable on internet: <http://www.prince2.com>.

Course language:
Slovak or english

Notes:

Course assessment Total number of assessed students: 122					
A	B	C	D	E	FX
26.23	25.41	22.13	12.3	5.74	8.2
Provides: Mgr. Alexander Szabari, PhD., prof. RNDr. Gabriel Semanišin, PhD.					
Date of last modification: 23.09.2021					
Approved:					

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: 6., 8.

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: 15

A	B	C	D	E	FX
66.67	26.67	0.0	6.67	0.0	0.0

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

Date of last modification: 26.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ TMS/10	**Course name:** Secrets of microworld

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., 6.

Course level: I.

Prerequisities:

Conditions for course completion:
1. Active participation in lectures
2. Written term task and its presentation
Credit evaluation of the subject: direct teaching and consultations (1 credit), self-study (1 credit), practical activities - semester task and evaluation (1 credit). Total 3 credits.
The minimum threshold for completing the course is to obtain at least 51% of the total evaluation, using the following rating scale: A (91-100%), B (81-90%), C (71-80%), D (61-70 %), E (51-60%), F (0-50%).

Learning outcomes:
To give a review of the recent results form the elementary particle physics for non-physicists layman level.

Brief outline of the course:
1.-2. Atom and nucleus. Atoms as composed particles, discovery of electron. Thompson model, natural radioactivity. discovery of the nucleus. Rutherford and Bohr model of atoms, neutron discovery, nuclear structure.
3. Forces in Nature: gravitational, electromagnetic, weak and strong - their action and range.
4. Quantities and units in subnuclear physics.
5.-7. The most recent results about the structure of matter and forces: nuclear particles - particle "ZOO", classification of particles and quark model.
8.-10. Experimental methods in high energy physics: basic principles of particle accelaration and detection.
11.-12. Review of contemporary experiments in subnuclear physics - RHIC in BNL (USA), LHC CERN (Switzerland), Nuclotron/NICA JINR Dubna (Russia).

Recommended literature:
1.F. Close: The New Cosmic Onion: Quarks and the Nature of the Universe , CRC Press, 2006
2. J. Žáček: Úvod do fyziky elementárních částic, Karolinum, Praha, 2005
3. R. Mackintosh et al. : Jádro - cesta do srdce hmoty, Academia, Praha, 2003
4. M. Veltman M: Facts And Mysteries In Elementary Particle Physics, World Scientific Publishing Co Pte Ltd, 2003

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 70

A	B	C	D	E	FX
74.29	15.71	10.0	0.0	0.0	0.0

Provides: doc. RNDr. Adela Kravčáková, PhD., RNDr. Martin Vaľa, PhD.

Date of last modification: 16.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/BAPS/15	**Course name:** Security and administration of computer systems

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: I.

Prerequisities: ÚINF/KRS/15 and (ÚINF/ADL1/15 or ÚINF/ADW1/15) and (ÚINF/ARP1/15 or ÚINF/FAN/15) and ÚINF/SKB1/15

Conditions for course completion:
Appropriate knowledge and competencies from the profile courses of the specialisation Security and administration of computer systems, demonstrating the ability to synthesise the acquired knowledge and procedures and apply them to computer problems.

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

Brief outline of the course:
1. Programming techniques, data structures, algorithms and their complexity.
2. Principles of operating.
3. Database systems.
4. Fundamental computer architectures.
5. Cryptographic systems and their applications.
6. Network and communication security.

Recommended literature:
Information sources recommended within individual profile courses.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 2

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

Provides:

Date of last modification: 17.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

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

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 7.

Course level: I., II.

Prerequisities:

Conditions for course completion:

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

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

Recommended literature:
Internet sources and specifications.

Course language:

Notes:

Course assessment
Total number of assessed students: 96

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

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SPG1/15	**Course name:** Seminar on computer graphics

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: 6.

Course level: I., II.

Prerequisities: ÚINF/UGR1/15

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: 42

A	B	C	D	E	FX
76.19	11.9	7.14	2.38	0.0	2.38

Provides: RNDr. Rastislav Krivoš-Belluš, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/PRIS/15	**Course name:** Software and information system

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: I.

Prerequisities: ÚINF/ASU1/15 and ÚINF/TVP1/21 and ÚINF/PMO1/15 and ÚINF/SWI1b/15

Conditions for course completion:
Appropriate knowledge and competencies from the profile courses of specialisation Programming and information systems, demonstrating the ability to synthesise the acquired knowledge and procedures and apply them to problems from the area of informatics.

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

Brief outline of the course:
1. Programming techniques, data structures, algorithms and their complexity.
2. Principles of operating systems.
3. Database systems.
4. Principles and methods of software engineering.
5. Principles and methods of business process modelling.

Recommended literature:
Information sources recommended within individual profile courses.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 37

A	B	C	D	E	FX
27.03	18.92	35.14	8.11	10.81	0.0

Provides:

Date of last modification: 17.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SWI1a/15	**Course name:** Software engineering

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.

Prerequisities: ÚINF/DBS1a/15

Conditions for course completion:
The evaluation will be given on the basis of the proper fulfilment of the partial tasks of solving the (group) project during the semester. The minimum prerequisite for passing the subject is obtaining 50% of the total possible number of points. The sub-probation conditions for evaluation are published in the AIS.

Learning outcomes:
By completing the subject, the student:
- acquires basic knowledge of the principles and methods of software engineering,
- get familiar with the individual stages of the software development life cycle,
- familiarizes himself with the modeling of software systems and acquires basic knowledge from the use of relevant SW tools,
- will gain basic experience in working in a team and with project management and presentation.

Brief outline of the course:
1. Introduction to software engineering.
2. Software processes
3. Selected support tools for managing software processes.
4. Requirements engineering.
5. Agile methods.
6. Modeling of systems.
7. Implementation of software systems.
8. Architectures of software systems.
9. Testing.
10. Evolution of systems.
11. Case studies of software systems.

Recommended literature:
1. BERKUN, S. The Art Of Project Management. O Reilly, 2005.
2. BJORNER, D. Software engineering 1,2,3. Springer-Verlag Berlin, 2006.
3. SOMMERVILLE, I. Software Engineering. Addison-Wesley, 2015.

Course language:

Slovak or English

Notes:
Content prerequisities: Database systems, OOP

Course assessment
Total number of assessed students: 346

A	B	C	D	E	FX
20.23	24.57	19.36	16.47	17.92	1.45

Provides: RNDr. Dávid Varga, prof. RNDr. Gabriel Semanišin, PhD.

Date of last modification: 25.07.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ SWI1b/15	**Course name:** Software engineering

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: 5.

Course level: I.

Prerequisities: ÚINF/SWI1a/15

Conditions for course completion:
Evaluation of the quality of the processed project, its presentation and defense.

Learning outcomes:
To learn principles and to developed fundamental skills concerning software modelling, development and implementation.

Brief outline of the course:
1. Software Evolution
2. Safety Engineering
3. Security Engineering, Resilience Engineering
4. Software Reuse
5. Distributed Software Engineering
6. Service - oriented Software Engineering
7. Systems of Systems
8. Real - time Software Engineering
9. Project planning
10. Quality management
11: Configuration management

Recommended literature:
1. BERKUN, S. The Art Of Project Management. O Reilly, 2005.
2. BJORNER, D. Software engineering 1,2,3. Springer-Verlag Berlin, 2006.
3. PRINCE2. Dostupné na internete: <http://www.prince2.com>.
4. SOMMERVILLE, I. Software Engineering. Addison-Wesley, 2007.
5. UML. Dostupné na internete: <http://www.uml.org>.

Course language:
Slovak or English

Notes:
content prerequisities: advanced programming

Course assessment Total number of assessed students: 288					
A	B	C	D	E	FX
47.22	20.14	12.15	7.29	11.81	1.39
Provides: Mgr. Alexander Szabari, PhD.					
Date of last modification: 23.11.2021					
Approved:					

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ BZP1a/15	**Course name:** Special seminar to bachelor 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: 7.

Course level: I.

Prerequisities: ÚINF/PBS/15

Conditions for course completion:
Update of the bachelor thesis website. Presentation of the current state of knowledge for the topic selected in the bachelor's thesis. Presentation of the first results of bachelor thesis. Preparing of scientific article of 5 pages length in the required structure. Approval of the article by the thesis supervisor.

Learning outcomes:
Basic knowledge about the procedure and writing of the bachelor's thesis, standards and formal aspects of the bachelor's thesis, the creation of bibliographic references and their citations, tools for creating the database of used literature. Basic knowledge of the content and form of presentation of the current state of knowledge for the topic of the bachelor's thesis. Basic knowledge about the preparation of a scientific article.

Brief outline of the course:
1. Procedure for writing the bachelor thesis.
2. Standards and formal aspects of the bachelor thesis.
3. Rules of writing and editing documents STN 01 6910.
4. Documentation, Numbering of sections and subsections of written documents STN ISO 2145.
5. Information and documentation STN ISO 690.
6. Instructions for creating bibliographic references to information sources and their citation.
7. Selected typographic principles.
8. Professional resources on the Internet.
9. Principles of correct citation.
10. Tools for creating your own database of used literature.
11. Annotation of read literature, creation of searches.
12. Presentation of selected topics of bachelor theses.
13. Presentation of selected topics of bachelor theses.

Recommended literature:
1. STN 01 6910. Rules of writing and editing documents. 2011.
2. STN ISO 2145. Documentation. Numbering of sections and subsections of written documents. 1997.

3. STN ISO 690. Information and documentation. Instructions for creating bibliographic references to information sources and their citation. 2012
4. KATUŠČÁK, Dušan: How to write final and qualification theses. Enigma, 2013
5. Scientific literature related to the topic of the final thesis according to the recommendation of the thesis supervisor.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 146

abs	n	neabs
96.58	3.42	0.0

Provides: doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ BZP1b/15	**Course name:** Special seminar to bachelor 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: 8.

Course level: I.

Prerequisities: ÚINF/BZP1a/15 or ÚINF/SZPa/22

Conditions for course completion:
Update of the bachelor thesis website. Presentation of the obtained results of the bachelor's thesis. Preparation of at least a 10-page scientific article for the topic chosen in the bachelor's thesis in the required structure and its approval by the thesis supervisor. Creating a promotional image (poster) about the results of the bachelor's thesis.

Learning outcomes:
Basic knowledge of the central register of final theses, licenses and copyrights, content and form of presentation of the overall results achieved in the bachelor's thesis. Basic knowledge about the preparation of a scientific article and presentation of the achieved results for popularization purposes.

Brief outline of the course:
1. Central register of final theses.
2. Licenses and Copyrights.
3. Directive on basic requirements for final theses at UPJŠ in Košice.
4. The most common mistakes in writing a final thesis.
5. Evaluation criteria and examples of assessments.
6. Preparation of a presentation for the defense of the final thesis.
7. Preparation of a scientific article.
8. Preparation of a presentation for the defense of the final thesis.
9. Preparation of a scientific article.
10. Procedure for submitting the final thesis.
11. Popularization of bachelor thesis results.
12. Presentations of the results of bachelor theses.
13. Presentations of bachelor thesis results.

Recommended literature:
1. STN 01 6910. Rules of writing and editing documents. 2011.
2. STN ISO 2145. Documentation. Numbering of sections and subsections of written documents. 1997.
3. STN ISO 690. Information and documentation. Instructions for creating bibliographic references to information sources and their citation. 2012

4. KATUŠČÁK, Dušan. How to write final and qualification theses. Enigma, 2013
5. Scientific literature related to the topic of the final thesis according to the recommendation of the thesis supervisor.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 133

abs	n
99.25	0.75

Provides: doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 26.08.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SSBa/20	**Course name:** Specialized seminar to bachelor 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: 7.

Course level: I.

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: 43

abs	n
100.0	0.0

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Juraj Šebej, PhD., RNDr. Miroslav Opiela, PhD., doc. RNDr. Ľubomír Antoni, PhD.

Date of last modification: 17.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/SSBb/20	**Course name:** Specialized seminar to bachelor 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: 8.

Course level: I.

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: 44

abs	n
95.45	4.55

Provides: doc. RNDr. JUDr. Pavol Sokol, PhD., RNDr. Juraj Šebej, PhD., doc. RNDr. Ľubomír Antoni, PhD., RNDr. Miroslav Opiela, PhD.

Date of last modification: 17.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MSU/07	**Course name:** Statistical Methods of Data Analysis

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: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
1. Active participation in lectures and excersises
2. 2x test
3. Passing the oral exam

Detailed conditions are updated annually on the electronic bulletin board of the course in AiS2 or within the repository for digital support materials (LMS UPJŠ, MS Teams UPJŠ, etc.)
The teacher justifies the justified non - participation of the student (incapacity for work, family reasons, etc.) a maximum of two lectures during the semester without the need for replacement.
In the event of a longer-term justified absence (for example due to incapacity for work), it shall determine the student an alternative form of mastering the missed study matter.
Credit evaluation of the course takes into account the following student workload: direct teaching and individual consultations (2 credits), self-study (1 credit), evaluation (1 credits). The minimum threshold for completing the course is to obtain at least 51% of the total score, using the following rating scale: A (91-100%), B (81-90%), C (71-80%), D (61- 70%), E (51-60%), F (0-50%).

Learning outcomes:
General introduction to theory of probability, random processes and mathematical statistics.

Brief outline of the course:
1. Random phenomena, random quantities and variables.
2. Interpretations and concept of probability, different definitions of probability.
3. Distribution functions and probability density.
4. Discrete and continuous random variables. Moments of distributions. Covariance and correlation.
5. Distributions: binomial, Poisson, normal, negative binomial, geometric, multinomial.
6. Distributions: uniform, exponential, multivariate, Gaussian, Cauchy distributions. Central limit theorem.
7. Distrbutions: chi-squared, Student and Fisher. Quantiles.
8. Characteristic function.
9. Chebyshev inequality. Chebyshev theorem. Bernoulli theorem.
10. Law of large numbers. The estimates of parameters of theoretical distributions from measured data. The maximum likelihood method. The weighted mean.
11. Statistical and systematic measurement errors. Estimation of errors. Propagation of errors.

12. Hypotheses testing. Null and alternative hypotheses. The least squares method. Linear and non-linear regression. Quality of regression, significance level.

Recommended literature:

1) L. Lyons, Statistics for Nuclear and Particle Physics, CUP, 1989.
2) L. Lyons, A Practical Guide to Data Analysis for Physical Science Students, CUP, 1991.
3) J.R. Taylor, An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, University Science Books, 1997.

Course language:

Notes:

Course assessment

Total number of assessed students: 101

A	B	C	D	E	FX
20.79	10.89	10.89	11.88	45.54	0.0

Provides: doc. RNDr. Adela Kravčáková, PhD.

Date of last modification: 16.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ SXM1/15	**Course name:** Structure formats and representation of data

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: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
Evaluation of partial exercises.
Evaluation of multiple assignments corresponding to learning blocks.
Final written test.

Learning outcomes:
Become acknowledged with theoretical concepts and methodologies with structured and semistructured data. Acquire programming skills with implementations of these concepts.

Brief outline of the course:
1. Representation of semi-structured data in XML, valid and well-formed XML document.
2. XML parsers: DOM,
3. SAX parser.
4 StAX parser.
5. Java API of XML parsers.
7. Schemas for XML documents: DTD, XML Schema.
8. Addressing in XML: XPath.
9. Transformations of XML documents: XSLT.
10. Other formats for semistructured data: JSON, YAML.
11. API for data binding in Java: Jackson (JSON), SnakeYAML (YAML), JAXB (XML).

Recommended literature:
1. Eliotte "Rusty" Harold. XML Bible, Gold Edition. Wiley, 2001. ISBN 978-0764548192.
2. Grigoris Antoniou, Frank Van Harmelen. A Semantic Web Primer, Second Edition. MIT Press, 2008. ISBN 978-0262012423.
3. Michaek Kay. XSLT 2.0 Programmer's Reference, 3rd Edition. Wrox, 2004. ISBN: 978-076456909.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 90

A	B	C	D	E	FX
35.56	22.22	21.11	11.11	8.89	1.11

Provides: Mgr. Alexander Szabari, PhD., RNDr. Zoltán Szoplák

Date of last modification: 23.11.2021

Approved:

COURSE INFORMATION LETTER

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

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 6.

Course level: I., II.

Prerequisities:

Conditions for course completion:
It is required to be registered for the participation on the Student Scientific Conference (ŠVK) in accordance to the Statute of the Student Scientific Conference at PF UPJŠ and the specific conditions for participation in a given year, which are announced by the dean of the faculty. Within one year of the ŠVK, a student or a research team can register in one track only. It is also possible to apply with a written work that is an integral part of a bachelor's or master's thesis or a result of a student support program. The written work at ŠVK is the result of the student's own work or the work of the research team. It must not show elements of academic fraud and must meet the criteria of good research practice defined in the Rector's Decision no. 21/2021, which lays down the rules for assessing plagiarism at Pavol Jozef Šafárik University in Košice and its components. Fulfillment of the criteria is verified mainly in the process of supervision and in the process of work presentation. Failure to do so is reason for disciplinary action. The condition for the evaluation is a successful presentation and defense of the work in the relevant track headed by a commission appointed by the dean of the faculty. The commission decides on the eligibility of credits and states its decision in the memorandum of the ŠVK.

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

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

Recommended literature:

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

Course language:
Slovak or english

Notes:

Course assessment
Total number of assessed students: 24

abs	n
100.0	0.0

Provides:

Date of last modification: 25.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ TVP1/21	**Course name:** Testing and verification of programs

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 6.

Course level: I.

Prerequisities:

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

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

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

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

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

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 57

A	B	C	D	E	FX
15.79	19.3	19.3	12.28	26.32	7.02

Provides: Mgr. Maroš Dzuriš

Date of last modification: 31.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ZPIa/18	**Course name:** Thesis in informatics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 7.

Course level: I.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 69

A	B	C	D	E	FX
73.91	13.04	8.7	1.45	1.45	1.45

Provides:

Date of last modification: 17.06.2018

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ZPIb/18	**Course name:** Thesis in informatics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 8.

Course level: I.

Prerequisities: ÚINF/ZPIa/22

Conditions for course completion:
To be awarded the credits, students are required to participate regularly in consultations according to the supervisor's instructions, continuously read the recommended literature and work on own bachelor thesis, the written draft of which will be submitted by a student for final assessment according to the supervisor's instructions.

Learning outcomes:
Students are able to manage preparation and writing of own bachelor thesis in terms of is structure, time schedule and format in line with valid standards. Under supervision of the supervisor students make initial research of sources, research itself and writing of the thesis.

Brief outline of the course:
Bachelor thesis (its place and importance in university education), time schedule of preparation of bachelor thesis, main parts of bachelor thesis, format of bachelor thesis, principles of quotation and bibliography references. The seminar is scheduled in the form of individual consultations between the supervisor and a student, according to the supervisor's instructions. The content of the seminar depends on selected topic of the bachelor thesis, condition of its preparation and individual needs or agreement between the supervisor and a student.

Recommended literature:
The recommended literature is determined individually in accordance with the topic of the bachelor's thesis.

Course language:
Slovak, optionally English

Notes:

Course assessment
Total number of assessed students: 72

A	B	C	D	E	FX
76.39	12.5	6.94	0.0	2.78	1.39

Provides:

Date of last modification: 20.11.2021
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ TYS1/15	**Course name:** Typographical 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: 2

Recommended semester/trimester of the course: 6., 8.

Course level: I., N

Prerequisities:

Conditions for course completion:
Satisfiable ability to correct mainly mathematical typesetting.

Learning outcomes:
To provide the basic information on principles for typesetting of documents containing mathematical formulas.

Brief outline of the course:
1. Principles for typesetting of documents containing mathematical formulas.
2. Typesetting of a plain text, special text symbols, using of text fonts.3
3. TeX macros.
4. Enumerations in text and footnote command. Parameter setting determining the appearance of the pages.
5. Typesetting of mathematical formulas in text and displays, aligning formulas.
6. Making tables and pictures.
7. Definitions, theorems, and proofs in a mathematical document.
8. Contents, bibliography, sections in a document.
9. Pictures.
10.-12. Project.

Recommended literature:
1. D. E. Knuth, The TeXbook, Computers and Typesetting, Addison-Wesley, Reading, Massachusetts, 1986.
2. M. Doob, Jemný úvod do TeXu, CSTUG, 1990; èeský preklad z "A Gentle Introduction to TeX" (text vo¾ne prístupný v CTAN archíve).
3. O. Ulrych, AMS-TeX za 59 minút, (verzia 1.0), Praha, 1989.
4. J. Chlebíková, AMS-TeX (verzia 2.0), Bratislava, 1992.
5. M. Spivak, The Joy of TeX, Amer. Math. Soc., 1986.
6. L. Lamport, LaTeX: A Document Preparation System, Addison-Wesley, Massachusetts, 1986.
7. L. Lamport, MakeIndex: An index processor for LaTeX, 17 February 1987.
8. J. Rybièka, LaTeX pro začátečníky, Konvoj, Brno, 1995.
9. H. Partl, E. Schlegl, I. Hyna, P. Sýkora, LaTeX – Stručný popis.

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

Course language:
Slovak.

Notes:

Course assessment
Total number of assessed students: 254

A	B	C	D	E	FX
48.43	17.72	20.08	6.3	6.69	0.79

Provides: prof. RNDr. Stanislav Krajči, PhD.

Date of last modification: 08.01.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ WBdi/15	**Course name:** Web and a development of user environment

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2.

Course level: I.

Prerequisities:

Conditions for course completion:
50% of the mark for continuous assignments and discussion contributions

Learning outcomes:
Create accessible and usable Web Sites, used the standards (X) HTML and CSS.
Apply the rules for the page layout.
Maintain website and use the basic procedures for their promotion.

Brief outline of the course:
1. - Introduction, specifics of distance learning, orientation in LMS Moodle.
2. - (X)HTML - markup language for describing the structure and content of HTML documents.
3. - (X)HTML - markup language for describing the structure and content of HTML documents.
4. - (X)HTML - markup language for describing the structure and content of HTML documents.
5. - CSS - a markup language for describing how (X)HTML documents are displayed.
6. - CSS - a markup language for describing how (X)HTML documents are displayed.
7. - Page layout - the layout of the content of a web page.
8. - Page layout - the layout of the content of a web page.
9. - Web page accessibility.
10. - Web page accessibility.
11. - Usability of web pages.
12. - Usability of web pages.

Recommended literature:
Basic sources for distance courses will be published in LMS Moodle.
TITTEL, Ed a Jeff NOBLE. HTML, XHTML & CSS. 7th ed. Hoboken, NJ: Wiley, c2011, xx, 392 p. --For dummies. ISBN 04-709-1659-1.
LAGRONE, Benjamin. HTML5 and CSS3 responsive Web design cookbook. 1. publ. Birmingham [u.a.]: Packt Publishing, 2013. ISBN 978-184-9695-442.
CONNOR, Joshue O. Pro HTML5 accessibility: building an inclusive web. New York: Distributed to the book trade worldwide by Springer Science Business Media, c2012, xix, 365 p. ISBN 978-1-4302-4195-9.
KRUG, Steve. Nenuťte uživatele přemýšlet!: praktický průvodce testováním a opravou chyb použitelnost webu. Vyd. 1. Brno: Computer Press, 2010, 165 s. ISBN 978-80-251-2923-4.

LEAVITT, Michael O. a Ben SHNEIDERMAN. Research-Based Web Design & Usability Guidelines. Washington, D.C.: U.S. General Services Administration, 2006, xxii, 267 p. ISBN 0-16-076270-7. Dostupné z: https://www.usability.gov/sites/default/files/documents/guidelines_book.pdf
Vyhláška Úradu podpredsedu vlády Slovenskej republiky pre investície a informatizáciu zo 16. marca 2020 o štandardoch pre informačné technológie verejnej správy. In: . Bratislava: Ministerstvo spravodlivosti Slovenskej republiky, 2020, ročník 2020, číslo 78. Dostupné z: https://www.slov-lex.sk/static/pdf/2020/78/ZZ_2020_78_20210623.pdf

Course language:
Slovak language, knowledge of English is required only for reading documentation and web standards.

Notes:
Teaching is realized only by distance learning.

Course assessment
Total number of assessed students: 84

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72.62	26.19	1.19	0.0

Provides: PaedDr. Ján Guniš, PhD.

Date of last modification: 10.02.2022

Approved: