# CONTENT

**COURSE INFORMATION LETTER**

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

**Course assessment**
Total number of assessed students: 35

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 60.0 | 20.0 | 11.43 | 0.0 | 8.57 | 0.0 |

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

**Date of last modification:** 26.09.2021

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚMV/ ALG3b/10 | **Course name:** Algebra II for informaticians and physicists |
|---|---|

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

**Number of ECTS credits:** 7

**Recommended semester/trimester of the course:** 2.

**Course level:** I., II.

**Prerequisities:** ÚMV/ALGa/10

**Conditions for course completion:**
Exam

**Learning outcomes:**
To provide deeper knowledge on vector spaces, linear transformations and Euclidean spaces.

**Brief outline of the course:**
Vector spaces, subspaces. A basis, a dimension and a characterization of n-dimensional vector spaces. The rank of a matrix. Linear transformations and their matrices. Operations with linear tranformations, matrices of sums and compositions of linear tranformations. Regular linear transformations, regular matrices. Similar matrices. Characteristic vectors and characteristic values of linear transformations.
Affine spaces, subspaces and their positions. Euclidean spaces, the distance of subspaces. Conics and quadrics.

**Recommended literature:**
A. F. Beardon: Algebra and Geometry, Cambridge University Press, 2005
G. Birkhoff, S. Mac Lane: A Survey of Modern Algebra, New York 1965

**Course language:**
Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 317

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 15.77 | 10.41 | 12.93 | 18.93 | 32.18 | 9.78 |

**Provides:** doc. RNDr. Roman Soták, PhD., Mgr. Martin Vodička

**Date of last modification:** 26.03.2020

**Approved:**

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚINF/ ANP/15 | **Course name:** Algorithmic unsolved problems |

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
Satisfiable understanding of basic concepts.

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 27

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

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

**Date of last modification:** 23.11.2021

**Approved:**

**COURSE INFORMATION LETTER**

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** KF/ AFS/05 | **Course name:** Ancient Philosophy and Present Times |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 2.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
When implementing the subject in the classical - face-to-face - form of teaching:
40% - continuous assessment of student activity at seminars, partial seminar work - assignment.
60% - final test, or seminar paper in the range of 10 A4 standard pages (with compliance with the KF citation standard for seminar and qualification papers.
In the case of a transition to distance education, students will be assigned sub-tasks for studying philosophical texts and processing the task in written form, which must be submitted by the set deadline, will be assigned points (partial assessment) and at the end will prepare a seminar paper to the same extent as in the face-to-face form teaching.

**Learning outcomes:**

**Brief outline of the course:**
Point out the roots of Western civilization that go back to the Greeks. The ancient Greeks, as one of the 3 pillars of European culture, reveal the origins of democracy and critical thinking. Emphasizing the interconnectedness of ancient philosophy and EPISTEME will enable a better understanding of the issues of thought formation, the relationship between philosophy and science, and modern society, where the emergence of mathematical natural science in the 17th century is the pillar on which Europe and European humanity stand. The student will be able to understand the questions and problems of today if he discovers the foundations and contexts leading to serious questions of today's form of society, thinking, science and culture.

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 31

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 80.65 | 6.45 | 6.45 | 0.0 | 6.45 | 0.0 |

**Provides:** doc. PhDr. Peter Nezník, CSc.

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|---|
| **Date of last modification:** 24.08.2022 |
| **Approved:** |

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚINF/ APS1/15 | **Course name:** Applied probability and statistics |
|---|---|

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 1.

**Course level:** I., II., N

**Prerequisities:** ÚMV/FRPb/19 or ÚMV/MAN2c/22 or ÚMV/MTIb/21 or ÚMV/MTI4b/22 or ÚMV/MTFb/22

**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 is able to apply the acquired concepts and techniques of probability theory and mathematical statistics in formulating hypotheses within the considered models and analysis of data dependencies, and use the appropriate software.

**Brief outline of the course:**
1) Random event, probability and conditional probability.
2) Probability distribution laws.
3) Characteristics of position, variability and dependence.
4) Basic discrete and continuous distributions.
5) The law of large numbers and the central limit theorem.
6) Random sample. Initial analytical and geometric analysis of data.
7) Quantiles, basic distributions and basic theorem of mathematical statistics.
8) Theory of estimates, method of moments and maximum likelihood. Hypothesis testing.
9) Tests on distribution parameters and goodness-of-fit tests.
10) Modeling of dependencies and noise. Least squares method and smoothing.
11) Polynomial regression models.
12) Pseudorandom quantities and Monte Carlo methods.

**Recommended literature:**
- Cs. Török: Úvod do teórie pravdepodobnosti a matematickej štatistiky, Košice, 1992
- M.R.Spiegel, J.J.Schiller, R.A.Srinivasan, Probability and Statistics, McGraw Hill, 2009
- J. Maindonald, W.J. Braun, Data Analysis and Graphics Using R – an Example-Based Approach, CAMBRIDGE UNIVERSITY PRESS, 2010

**Course language:**
Slovak or english

**Notes:**
Face to face or online teaching.
Content prerequisites:
the basics of differential, integral and matrix calculus

**Course assessment**
Total number of assessed students: 90

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 16.67 | 15.56 | 24.44 | 12.22 | 30.0 | 1.11 |

**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:** ÚINF/APA1/21 | **Course name:** Approximation algorithms |
|---|---|

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 5.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
Continuous assessment is awarded on the basis of the quality of homework given in lectures and continuous written test.
Oral final exam.

**Learning outcomes:**
To learn basic conceptions of randomized algorithms and to classify the algorithms due to their error probability.

**Brief outline of the course:**
1. Basic notions of Probability Theory.
2. Basic randomized computing models and its characterisations.
3. Las Vegas algorithms.
4. One sided error Monte Carlo algorithms.
5. Two sided bounded error Monte Carlo algorithms.
6. Two sided unbounded error Monte Carlo algorithms.
7. Classes of randomized algorithms with polynomial time complexity and relationships between them.
8. Optimisation problem, approximation algorithm, relative error, approximation ratio.
9. Special optimisation problems and approximation solutions.
10. Classification of optimisation problems based upon their approximations.
11. FPTAS.
12. PTAS.
13. TSP problem and its relaxations.
14. Unapproximability.

**Recommended literature:**
Hromkovič, J.: Algorithmics for Hard Problems, Introduction to Combinatorial Optimization, Randomization, Approximation, and Heuristics, Springer=Verlag 2004.
Hromkovič, J.: Communication Protocols - An Exemplary Study of the Power of Randomness. In: Handbook on Randomized Computing, P.Pardalos, S.Rajasekaran, J.Reif, J.Rolim, Eds., Kluwer Publ., 2001.
Hromkovič, J.: Design and analysis of ranodmized algorithms. Springer-Verlag, 2005.

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 95

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 24.21 | 13.68 | 23.16 | 15.79 | 22.11 | 1.05 |

**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/ UUI1/15 | **Course name:** Artificial Intelligence and Cognitive Science |

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

**Number of ECTS credits:** 3

**Recommended semester/trimester of the course:** 4., 6.

**Course level:** II., N

**Prerequisities:**

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

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

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

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

2020. ISBN-13: 978-0262043250

**Course language:**
Slovak or english

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

**Course assessment**
Total number of assessed students: 98

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

**Provides:** doc. Ing. Norbert Kopčo, PhD.

**Date of last modification:** 23.11.2021

**Approved:**

## 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:** 1.

**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:** ÚFV/ BSIM1/14 | **Course name:** Biomolecular Simulations |
|---|---|

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 6.

**Course level:** I., II.

**Prerequisities:**

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

**Learning outcomes:**
Introduction to actual problematics of biomolecular simulations.

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

**Recommended literature:**
Actual literature recommended by lecturer.

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 56

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

**Provides:** doc. RNDr. Jozef Uličný, CSc.

**Date of last modification:** 27.03.2020

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚINF/ PSDU/16 | **Course name:** Case studies in data mining |
|---|---|

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
The realization of a project focused on case studies in data mining.
Successful completion of the written and oral part of the exam focused on case studies in data mining.

**Learning outcomes:**
Solving practical tasks in the field of data mining. Basic concepts of data mining. Knowledge of data mining methods.

**Brief outline of the course:**
1. Basic notions in data mining
2. Data preparation in data mining
3. Methods and algorithms of data mining
4. Methods and algorithms of data mining II
5. Extraction of knowledge from large data volumes
6. Case study analysis using data mining methods in different application areas
7. Case study analysis using data mining methods in different application areas II
8. Application of methods for automated analysis of large data volumes
9. Solving practical tasks using appropriate software tools
10. Solving practical tasks using appropriate software tools II
11. Solving practical tasks using appropriate software tools III
12. Testing data mining algorithms
13. Testing data mining algorithms II

**Recommended literature:**
[1] Watt, J., Borhani, R., Katsaggelos, A.K.: Machine learning refined: foundations, algorithms, and applications. Cambridge: Cambridge University Press, 2016.
[2] Zhao, Y., Cen, Y.: Data Mining Applications with R. Elsevier Inc. 2014.
[3] Han, J. and Kamber, M.: Data Mining Concepts and Techniques. 3rd Edition, Morgan Kaufmann, Burlington, 2011.
[4] Witten, I.E., Frank, E.: Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, 2005.

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 25

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

**Provides:** RNDr. Erik Bruoth, PhD., doc. RNDr. Ľubomír Antoni, PhD.

**Date of last modification:** 14.11.2021

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** KF/ KDF/05 | **Course name:** Chapters from History of Philosophy of 19th and 20th Centuries (General Introduction) |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 2.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**

**Learning outcomes:**

**Brief outline of the course:**

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 10

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 50.0 | 20.0 | 10.0 | 0.0 | 10.0 | 10.0 |

**Provides:** PhDr. Dušan Hruška, PhD.

**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/ KKV1/21 | **Course name:** Classical and quantum computations |
|---|---|

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

**Number of ECTS credits:** 6

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

**Course level:** II., N

**Prerequisities:**

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

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

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

= basic quantum computer programming skills.

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

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

**Recommended literature:**

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

**Course language:**
Slovak or english

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

**Course assessment**
Total number of assessed students: 83

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 26.51 | 40.96 | 15.66 | 4.82 | 2.41 | 9.64 |

**Provides:** prof. RNDr. Gabriel Semanišin, PhD., RNDr. Marek Semjan

**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/ 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:** 3., 5.

**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:** ÚMV/ KOA/10 | **Course name:** Combinatorial algorithms |
|---|---|

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

**Number of ECTS credits:** 6

**Recommended semester/trimester of the course:** 4., 6.

**Course level:** II.

**Prerequisities:**

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

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

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

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

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

**Course language:**
Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 99

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 35.35 | 26.26 | 22.22 | 9.09 | 5.05 | 2.02 |

**Provides:** RNDr. Mária Maceková, PhD.

**Date of last modification:** 19.04.2022

**Approved:**

**COURSE INFORMATION LETTER**

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 281

| abs | n | z |
|---|---|---|
| 98.22 | 1.78 | 0.0 |

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

**Date of last modification:** 31.07.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚINF/TVY/15 | **Course name:** Computability theory |
|---|---|

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

**Number of ECTS credits:** 4

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

**Course level:** I., II.

**Prerequisities:**

**Conditions for course completion:**
Two written examinations focused on the construction of Turing machines, creating sequences of (primitive) recursive functions, solving examples. Oral exam focused on the relationship between classes of recursive and computable functions, the problem of stopping a Turing machine.

**Learning outcomes:**
Knowledge of computational model of Turing machine, Goedelian arithmetization, and relationship between Turing computability and recursivity of functions.

**Brief outline of the course:**
1. Turing machine, basic principles of work of Turing machine, formalization of basic notions
2. Shifting of states, compositions of machines, computations on composed machines
3. Modifications of configuration
4. Elementary Turing machines
5. Compositions of elementary Turing machines
6. Primitively recursive functions
7. Primitively recursive predicates
8. Functions and predicates from number theory
9. Goedelian arithmetizationa of Turing computability
10. Recursive functions
11. Relationship of recursivity and Turing computability
12. Halting problem

**Recommended literature:**
1. BRIDGES, Douglas. Computability, A Mathematical Sketch book. Springer--Verlag, 1994. ISBN:: 978-0387941745
2. BUKOVSKÝ, Lev. Teória algoritmov, ES UPJŠ, Košice, 1999. ISBN 8070973730
3. MACHTEY, Michael a Paul YOUNG. An Introduction to the General Theory of Algorithms, North--Holland, Amsterdam 1978.
4. KRAJČI, Stanislav. Teória vypočítateľnosti. http://ics.upjs.sk/~krajci/skola/vyucba/ucebneTexty/vypocitatelnost.pdf

**Course language:**

Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 299

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 49.16 | 11.71 | 12.04 | 5.35 | 5.69 | 16.05 |

**Provides:** prof. RNDr. Stanislav Krajči, PhD., doc. RNDr. Ľubomír Antoni, 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/ VKN/15 | **Course name:** Computational and cognitive neuroscience II |
| **Course type, scope and the method:**<br>**Course type:** Lecture / Practice<br>**Recommended course-load (hours):**<br>**Per week:** 2 / 2 **Per study period:** 28 / 28<br>**Course method:** present | |
| **Number of ECTS credits:** 5 | |
| **Recommended semester/trimester of the course:** 3., 5. | |
| **Course level:** II., N | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Midterm exam<br>Final exam consisting of written and/or oral part | |
| **Learning outcomes:**<br>Advanced topics in computational and cognitive neuroscience, and in the tools used in neuroscience. | |
| **Brief outline of the course:**<br>1. Intro: Cognitive psychology, neural modeling.<br>Theme 1: Topics in cognitive and neural science<br>2. Neural basis of vision<br>3. Visual object recognition and visual scene analysis<br>4. Auditory cognition. Echo suppression. Auditory scene analysis<br>5. Cortical sound processing.<br>6. Other topics in the study of brain and main: thinking, consciousness, emotions, motivation<br>Topic 2: Modeling in cognitive and neural science<br>7. Intro<br>8. Connectionism, STM and LTM modeling<br>9. Additive and shunting neural networks.<br>10. Learning rule Outstar.<br>11. Adaptive resonance theory.<br>12. Statistical and decision-theory modeling<br>Topic 3: Current research at UPJS<br>13. Invited lecture | |
| **Recommended literature:**<br>1. KANDEL, E. R., SCHWARTZ, J. H. and JESSELL, T.M.: Principles of Neural Science. McGraw-Hill, 2021 ISBN-13: 978-1259642234<br>2. Dayan P and LF Abbott: Theoretical Neuroscience - Computational and Mathematical Modeling of Neural Systems. MIT Press, 2005 ISBN-13: 978-0262541855<br>3. Thagard P: Mind: Introduction to Cognitive Science, 2nd Edition. Bradford Books. ISBN-13 : 978-0262701099 | |

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 9

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 44.44 | 11.11 | 22.22 | 11.11 | 11.11 | 0.0 |

**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/ VYZ1/15 | **Course name:** Computational complexity |

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 3.

**Course level:** II., N

**Prerequisities:**

**Conditions for course completion:**
Oral examination.

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

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

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

**Recommended literature:**

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

**Course language:**
Slovak or english

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

**Course assessment**
Total number of assessed students: 357

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 57.7 | 15.41 | 12.04 | 7.28 | 7.28 | 0.28 |

**Provides:** prof. RNDr. Viliam Geffert, DrSc.

**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/ ARP1/15 | **Course name:** Computer architecture |
|---|---|

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4., 6.

**Course level:** I., II., N

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

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

**Course assessment**
Total number of assessed students: 60

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

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

**Date of last modification:** 23.11.2021

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:**

**Course level:** II.

**Prerequisities:** ((ÚINF/KRP1/15 or ÚINF/ARP1/15) and ÚINF/OPS1/15) or (ÚINF/LAD1/15 and ÚINF/AIS1/15) or (ÚINF/STU1/16 and (ÚINF/NEU1/15 or ÚINF/VKN2/22)) or (ÚINF/KKV1/21 and ÚMV/KOA/10)

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

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

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

**Recommended literature:**
Information sources recommended within individual profile subjects.

**Course language:**
Slovak language or English language

**Notes:**

**Course assessment**
Total number of assessed students: 63

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 50.79 | 19.05 | 19.05 | 7.94 | 3.17 | 0.0 |

**Provides:**

**Date of last modification:** 14.03.2023

| **Approved:** |
| --- |

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 4

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

**Course level:** I., II., N

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

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

**Course assessment**
Total number of assessed students: 27

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

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

**Date of last modification:** 08.01.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚINF/ KRS/15 | **Course name:** Cryptographic systems and their applications |
|---|---|

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

**Number of ECTS credits:** 6

**Recommended semester/trimester of the course:** 1.

**Course level:** I., II., N

**Prerequisities:**

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

**Learning outcomes:**
This course covers the basic knowledge in understanding and using cryptography. The main focus is on definitions, theoretical foundations, and rigorous proofs of security, with some programming practice. Topics include symmetric and public key encryption, message integrity, hash functions, block cipher design and analysis, number theory, and digital signatures. The course also provides an introduction to cryptographic protocols for authentication and key management, including PKI and certificates.

**Brief outline of the course:**
Classical cryptography, basic information theory, cryptoanalysis, security of classical ciphers. Symmetric ciphers - stream ciphers, block ciphers (DES, AES), modes of operation. Asymmetric ciphers - RSA, Elgamal, elliptic curve cryptosystems. Hash functions, message authentication codes, digital signatures. Authentication, key establishment and distribution, certificates.

**Recommended literature:**
1. PAAR, Ch., PELZL, J.: Understanding Cryptography, Springer 2010.
2. STINSON, D. R.. PATERSON, M. B.: Cryptography: Theory and Practie. CRC Press, 2018.
3. MAO, W. Modern Cryptography: Theory and Practice. Prentice Hall, 2003.
4. MENEZES, A., OORSCHOT, P. van, VANSTONE, S.: Handbook of Applied Cryptography. CRC Press, 1996.
5. SCHNEIER, B.: Applied Cryptography, 20th Edition, John Wiley & Sons Inc., 2015

**Course language:**
Slovak or English

**Notes:**
Content prerequisities: basic number theory and algebra, basic programming

**Course assessment**
Total number of assessed students: 119

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 14.29 | 9.24 | 14.29 | 13.45 | 31.93 | 16.81 |

**Provides:** doc. RNDr. Jozef Jirásek, PhD., 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/ 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:** 2.

**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/ DIPa/18 | **Course name:** Diploma thesis project |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 50

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**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/ DIPb/18 | **Course name:** Diploma thesis project |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 5.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 47

| abs | n |
|---|---|
| 95.74 | 4.26 |

**Provides:**

**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/ DPO/15 | **Course name:** Doctoral Thesis and its Defence |
| **Course type, scope and the method:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**Course method:** present | |
| **Number of ECTS credits:** 20 | |
| **Recommended semester/trimester of the course:** | |
| **Course level:** II. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>The diploma thesis is the result of the student's own work. It must not show elements of academic fraud and must meet the criteria of good research practice defined in the Rector's Decision no. 21/2021, which lays down the rules for assessing plagiarism at Pavol Jozef Šafárik University in Košice and its components. Fulfillment of the criteria is verified mainly in the process of supervision and in the process of thesis defense. Failure to do so is reason for disciplinary action. | |
| **Learning outcomes:**<br>The diploma thesis demonstrates mastery of extended theory and professional terminology of the field of study, acquisition of knowledge, skills and competencies in accordance with the declared profile of the graduate of the study program, as well as the ability to apply them creatively in solving selected field problems. Student demonstrates the ability of independent professional work in terms of content, formal and ethical. Further details on the diploma thesis are determined by Directive no. 1/2011 on the basic requirements of final theses and the Study Regulations of UPJŠ in Košice for the 1st, 2nd and combined 1st and 2nd degree. | |
| **Brief outline of the course:**<br>1. Elaboration of the diploma thesis in accordance with the instructions of the supervisor.<br>2, Presentation of the results of the diploma thesis before the examination commission.<br>3. Answering questions related to the topic of the diploma thesis within the discussion. | |
| **Recommended literature:**<br>The recommended literature is determined individually in accordance with the topic of the diploma thesis. | |
| **Course language:**<br>Slovak and optionally English. | |
| **Notes:** | |

| **Course assessment**<br>Total number of assessed students: 60 | | | | | |
|---|---|---|---|---|---|
| A | B | C | D | E | FX |
| 56.67 | 20.0 | 16.67 | 6.67 | 0.0 | 0.0 |
| **Provides:** | | | | | |
| **Date of last modification:** 19.11.2021 | | | | | |
| **Approved:** | | | | | |

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚINF/ FAN/15 | **Course name:** Forensic analysis |

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4., 6.

**Course level:** I., II.

**Prerequisities:** ÚINF/BPD1/15

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

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

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

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 23

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 34.78 | 30.43 | 17.39 | 8.7 | 8.7 | 0.0 |

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

**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/ZNA1/21 | **Course name:** Foundations of knowledge systems |
|---|---|

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 82

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 56.1 | 2.44 | 18.29 | 7.32 | 12.2 | 3.66 |

**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:** ÚMV/ FRPb/19 | **Course name:** Function of real variables |

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

**Number of ECTS credits:** 8

**Recommended semester/trimester of the course:** 2.

**Course level:** I., II.

**Prerequisities:** ÚMV/FRPa/19

**Conditions for course completion:**
Ongoing evaluation takes the form of small tests, projects and one main test during the semester. Overall evaluation is given by ongoing evaluation (60%), written and oral part of the exam (40%).

**Learning outcomes:**
The course provides students the basics of mathematical analysis necessary to study physics and computer science and related fields. The students also learn mathematical culture, notation and mathematical way of thinking and expression.

**Brief outline of the course:**
1. Numerical sequences.
2. Metric space, normed space - Euclid space, some topological properties of points and sets.
3. Function of several real variables - basic notions, limit and continuity.
4. Infinite series of numbers.
5. The integral calculus of function of one real variable:
a) Definite Riemann integral - definition, basic properties, calculation methods, classes of integrable functions, applications;
b) improper integral.
6. Differential calculus of functions of one variable. Functional, power and Taylor series of functions of one variable.
7. Ordinary differential equations - basic notions, equations of the first order (equations leading to separable and linear), linear equations of 2nd order with constant coefficients.
8. Differential calculus of functions of several real variables - partial derivative, differentiability and total differential (also of higher order), Taylor polynomial, directional derivative, local and global extrema, constrained local extrema.
9. Double (two-dimensional) integral - definition, calculation, applications.

**Recommended literature:**
1. B. Mihalíková, J. Ohriska: Matematická analýza 1, 2, vysokoškolský učebný text, UPJŠ v Košiciach, Košice, 2000, 2007.
2. L. Kluvánek, I. Mišík, M. Švec: Matematika I, II, SVTL, Bratislava, 1959.
3. Z. Došlá, O. Došlý: Diferenciální počet funkcí více proměnných, vysokoškolský učebný text, Masarykova univerzita v Brne, Brno, 2003.

4. J. Kopáček: Matematická analýza nejen pro fyziky I, II, Matfyzpress, Praha, 2004, 2007.
5. J. C. Robinson: An introduction to ordinary differential equations, Cambridge University Press, Cambridge, 2004.
6. R. E. Williamson, H. F. Trotter: Multivariable mathematics, Prentice Hall (Pearson), Upper Saddle River, 2004.
7. B. S. Thomson, J. B. Bruckner, A. M. Bruckner: Elementary real analysis, Prentice Hall (Pearson), Lexington, 2008.

**Course language:**
Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 548

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 10.77 | 12.41 | 15.15 | 21.35 | 33.94 | 6.39 |

**Provides:** doc. Mgr. Jozef Kiseľák, PhD., RNDr. Jaroslav Šupina, PhD.

**Date of last modification:** 15.04.2022

**Approved:**

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚGE/ GIS/15 | **Course name:** Geographic Information 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:** 1.

**Course level:** I., II.

**Prerequisities:**

**Conditions for course completion:**
The assessment is a combination of continual control during the practicals and the final exam in the examination period. The continual assessment is performed during the semester and it involves 2 written tests in the mid-term and end of the semester and a project report generated according to the assignment and practical skills acquired during the practicals. The student can proceed to the final exam in case he or she acquired at least 50 points of 100 in all elements of the the continual assessment. The final assessment mark is based on the average number points received in the mid-term test, project report, practicals assessment, and final exam. The final exam is a written test comprising 3-4 questions. The credits are given in case the student had reached at least the E mark in continual assessment and final exam. The following marking scheme is applied in the assessment: A (100-90 points), B (80-89 points), C (70-79 points), D (60-69 points), E (50-59 points), FX (0-49 points).

**Learning outcomes:**
The students gain knowledge on the intermediate levele in the theory of geoinformation science, GIS, and Remote Sensing, GIS data models, methods of data processing and spatial analysis.
They gain practical skills in processing of geographic data, management, analysis, and visualisation of the geographic data in a GIS project.
Students acquire competence in defining a GIS project, suitabla data models, methods of data acquisition, data processing, analysis and visualisation, presentation skills and skills in team work.

**Brief outline of the course:**
The course is focused on the following topics: geoinformatics as a scientific discipline, components of geographic information system, digital landscape representation and data models, GIS standards for coordinate systems and transformations, collection of geographic data for GIS (GNSS, photogrammetry, multispectral satellite imagery, lidar, radar) , data management in GIS, attribute and spatial demands, layer overlap, map algebra, spatial prediction, quality and uncertainty of geographic data, GIS web solutions, legislative aspects in GIS, GIS applications in practice.
Exercises are focused on working in ArcGIS Pro: basic and advanced vectorization, data organization in the geodatabase, import / export of various data formats to GIS, creation of color compositions from satellite images, mapping, 3D visualization and animation of geographic data, geoprocessing, map algebra, spatial and attribute demands, spatial prediction, analysis of digital

elevation models (DEM). Students learn the topics of the semester project in the middle of the semester and solve the assigned task in the team using the skills and knowledge acquired during the semester.

**Recommended literature:**

**Course language:**
Slovak or Czech or English

**Notes:**

**Course assessment**
Total number of assessed students: 383

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 28.46 | 26.89 | 26.89 | 12.01 | 5.74 | 0.0 |

**Provides:** doc. Mgr. Michal Gallay, PhD., Mgr. Michaela Nováková

**Date of last modification:** 27.06.2022

**Approved:**

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** KF/ DF2p/03 | **Course name:** History of Philosophy 2 (General Introduction) |

**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:**

**Course level:** I., II.

**Prerequisities:**

**Conditions for course completion:**
The condition for awarding the evaluation will be the active approach of students to fulfilling their study obligations, independent work with selected philosophical texts in the library, active participation and creative work in seminars. In connection with the possibility of interrupting face-to-face teaching, there will be greater demands on the student's independent study and the processing of professional literature, which will be continuously evaluated, using e-mail to communicate with the teacher, at the end of the semester, preparing and handing in the semester's seminar work by the set date, or also passing a knowledge test - about which the students will be informed in advance in sufficient time.

**Learning outcomes:**
Deepening knowledge about the development of spiritual culture in the European spiritual space and pointing out the most important sources of this development: (1) ancient philosophy and science, (2) Christianity as the second pillar of Europe, (3) the Renaissance and the emergence of modern science (mathematical natural science ) as the third pillar of European development. Development of critical thinking skills, active position in professional (ethics of science), public and private life (ethics of responsibility). Transcending narrowly specialized views of the world.

**Brief outline of the course:**

**Recommended literature:**
Antológia z diel filozofov. Predsokratovci a Platon. Zost. J. Martinka. Bratislava: Nakladateľstvo Epocha 1970; Antológia z diel filozofov. Od Aristotela po Plotina. Zost. J. Martinka. Bratislava: Nakladateľstvo Pravda 1972. Predsokratovci a Platon. Antológia z diel filozofov. Zost. J. Martinka. Bratislava: Vydavateľstvo Iris 1998. Od Aristotela po Plotina. Antológia z diel filozofov. Zost. J. Martinka. Bratislava: Vydavateľstvo IRIS 2006. Anzenbacher,A.: Úvod do filozofie. Prel. K. Šprunk. Praha: SPN 1990. Barthes, R.: Mytologie. Prel. J. Fulka. Praha: Dokořán 2004. Bělohradský, V.: Společnost nevolnosti. Eseje z pozdější doby. Praha: SLON 2009. Benjamin, W.: Iluminácie. Prel. A. Bžoch; J. Truhlářová. Bratislava: Kalligram 1999. Borges, J. L.: Borges ústne. Prednášky a eseje. Prel. P. Šišmišová. Bratislava: Kalligram 2005. Cassirer, E.: Esej o človeku. Prel. J. Piaček. Bratislava: Nakladateľstvo Pravda 1977. Debord, G.: Společnost spektáklu. Prel. J. Fulka; P. Siostrzonek. Praha: Nakladatelství :intu: 2007. Farkašová, E.: Na rube plátna. Bratislava: Vydavateľstvo Spolku slovenských spisovateľov 2013.

Feyerabend, P.: Věda jako umění. Prel. P. Kurka. Praha: JEŽEK 2004. Freud, S.: Nepokojenost v kultuře. Prel. L. Hošek. Praha: Hynek 1998. Hadot, P.: Co je antická filosofie. Prel. M. Křížová. Praha: Vyšehrad 2017. Hippokratés: Vybrané spisy. Prel. H. Bartoš; J. Černá; J. Daneš; S. Fischerová. Praha: OIKOYMENH 2012. Husserl, E.: Filosofie jako přísná věda. Prel. A. Novák. Praha: Togga 2013. Kuhn, T. S.: Štruktúra vedeckých revolúcií. Prel. J. Viceník. Bratislava: Nakladateľstvo Pravda 1981. Leško,V., Mihina, F. a kol.: Dejiny filozofie. Bratislava. Iris 1993 Leško, V.: Dejiny filozofie I. Od Tálesa po Galileiho. Prešov: v. n. 2004, 2007. Leško, V.: Dejiny filozofie II. Od Bacona po Nietzscheho. Prešov: v. n. 2008. McLuhan, M.: Jak rozumět médiím. Extenze člověka. Prel. M. Calda. Praha: Mladá fronta 2011. Patočka, J.: Duchovní člověk a intelektuál. In: Patočka, J.: Péče o duši III. Praha: OIKOYMENH 2002, s. 355 - 371. Popper, K. R.: Otevřená společnost a její nepřátelé I. Platónovo zaříkávání. Prel. M. Calda; J. Moural. Praha: OIKOYMENH 2011. Sloterdijk, P.: Kritika cynického rozumu. Prel. M. Szabó. Bratislava: Kalligram 2013. Störig,H .J.:Malé dějiny filozofie. Prel. P. Rezek. Praha: Zvon 1991. Wittgenstein, L.: Filozofické skúmania. Prel. F. Novosád. Bratislava: Nakladateľstvo Pravda 1979. Wright von, H. G.: Humanizmus ako životný postoj. Prel. M. Žitný. Kalligram 2001. Žižek, S.: Mor fantázií. Prel. M. Gálisová; V. Gális. Bratislava: Kalligram 1998.

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 746

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 60.59 | 14.21 | 12.6 | 8.58 | 3.35 | 0.67 |

**Provides:** doc. PhDr. Peter Nezník, CSc.

**Date of last modification:** 11.07.2022

**Approved:**

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** KF/ IH2/03 | **Course name:** Idea Humanitas 2 (General Introduction) |

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
100% graded credit: 40% (evaluated participation in seminars, processing of partial seminar work - separate assignment) 60% (final seminar work - student project). In the case of implementation of the classical form of teaching - face-to-face - active participation of the student in the seminar; study and reflection of assigned philosophical texts, attempt to interpret them. In the case of the introduction of distance education (as was the case due to Covid-19), the student will have to actively fulfill tasks of a partial nature, where increased demands will be placed on the student and his independent work with philosophical texts and literature. Tasks will be assigned to the students by the teacher on an ongoing basis. The student must study the assigned philosophical texts, think through and process them, submit them as a seminar paper, i.e. in written form. In both cases, the study of literature is necessary to pass the subject. The conclusion of the subject is the preparation of a seminar paper - the final seminar paper - in the range of at least 10 - 12 pages of A4 (with compliance with the bibliographic standard of the Department of Philosophy (KF) for seminar and qualification papers).

**Learning outcomes:**
To supplement and expand the interest of natural science students in social science issues related to the issues of the development of philosophy, science and human leadership, which are manifested in the urgent problems of today's world and society. Special emphasis is placed on the formation of humanistic ideas, their origin, transformation and possible pitfalls and risks. In addition to thinking about serious questions of the past and present, it also includes thinking about the present and the current contexts of major topics in philosophy and Western culture in particular. Therefore, the preparation and implementation of a program aimed at cooperation with alternative directions of pedagogy in the conditions of our transforming education system is understood as a practical output.

**Brief outline of the course:**
The age of the image of the world. Doubt as a principle of philosophy. The emergence of the image of the world (Weltbild); the differences of ancient theoria, medieval scientia, the emergence of mathematical natural science. Science as an operation (Betrieb); institutionalization of science. Philosophy, science and the modern world. The movement of human life: acceptance, defense, freedom as struggle, submission to finitude. The modern world and the search for meaning. Bureaucracy, impersonality, predominance of technocratic approaches. Fatigue as a modern threat

to Europe. The paths to freedom lead through the rediscovery of one's own Self and creativity. The basic condition for the educability of any education is the care of the soul. The crisis of European humanity. Antiquity. Philosophy - the emergence of a special community of people, the beginnings of education - paideia. The winding road of leadership. The origin and birthplace of calculating thinking. Europe and the post-European era. Care of the soul as a basic idea of Patočka's philosophy. The difference in the position of Plato and Democritus in understanding the care of the soul. The idea of caring for the soul and Aristotle.

**Recommended literature:**

Hadot, P.: What is ancient philosophy. Transl. M. Křížová. Prague: Vyšehrad 2017. Hegel, G. W. F.: Phenomenology of Spirit. Prague: NČSAV 1960 Husserl, E.: The Crisis of European Humanity and Philosophy. In: Crisis of European sciences and transcendental phenomenology. Prague: Academie 1996. Mokrejš, A.: Eros as a Theme of Greek Thought. Prague: Triton 2009. Patočka, J.: Péče o duši I. Prague. OIKOYMENH 1996. Patočka, J.: Care of the soul II. Prague. OIKOYMENH 1999. Vernant, J.-P.: The beginnings of Greek thought. Prague: OIKOYMENH 1995. Wright von, G.H.: Humanism as a life attitude. Bratislava: Kalligram 2001.

**Course language:**

**Notes:**

**Course assessment**

Total number of assessed students: 12

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 91.67 | 8.33 | 0.0 | 0.0 | 0.0 | 0.0 |

**Provides:** doc. PhDr. Peter Nezník, CSc.

**Date of last modification:** 24.08.2022

**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:** 3., 5.

**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/MIN1/15 | **Course name:** Informatics for medicine |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 5.

**Course level:** I., II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**
Content prerequisities: foundations of software engineering

**Course assessment**
Total number of assessed students: 87

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

**Provides:** Ing. Marián Zorkovský

**Date of last modification:** 17.11.2021

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 3

**Recommended semester/trimester of the course:** 6.

**Course level:** I., II.

**Prerequisities:** ÚINF/MIN1/15

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 13

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

**Provides:** Ing. Marián Zorkovský

**Date of last modification:** 17.11.2021

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**
Content prerequisities: Software engineering, UML, OOP

**Course assessment**
Total number of assessed students: 190

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

**Provides:** prof. RNDr. Gabriel Semanišin, PhD.

| |
|---|
| **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/ TIK1/15 | **Course name:** Information theory, encoding |
|---|---|

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
Satisfiable knowledge of basic notions

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

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

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

**Course language:**
Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 99

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 61.62 | 14.14 | 14.14 | 3.03 | 0.0 | 7.07 |

**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/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:** 1.

**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/ IDS18/18 | **Course name:** Introduction to data science |

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

**Number of ECTS credits:** 3

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 5

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 40.0 | 20.0 | 0.0 | 40.0 | 0.0 | 0.0 |

**Provides:** RNDr. Tomáš Horváth, 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/ 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:** 1.

**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/ PAI1/21 | **Course name:** Legal aspects of informatics |

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

**Number of ECTS credits:** 3

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

**Course level:** I., II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak

**Notes:**

| **Course assessment**<br>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/ LAD1/15 | **Course name:** Logical aspects of databases |
|---|---|

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4.

**Course level:** II., N

**Prerequisities:**

**Conditions for course completion:**
Satisfiable understanding of basic concepts.

**Learning outcomes:**
Ability to correctly formalize databases.

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

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

**Course language:**
Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 93

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 44.09 | 18.28 | 17.2 | 10.75 | 7.53 | 2.15 |

**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/ STU1/16 | **Course name:** Machine learning |
|---|---|

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

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

**Course language:**
Slovak language or English language

**Notes:**

**Course assessment**
Total number of assessed students: 60

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 36.67 | 18.33 | 26.67 | 10.0 | 8.33 | 0.0 |

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

**Date of last modification:** 31.03.2022

**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:** 2., 4.

**Course level:** I., II.

**Prerequisities:**

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

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

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

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

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

**Course language:**
Slovak or English.

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

**Course assessment**
Total number of assessed students: 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:** ÚINF/ NEU1/15 | **Course name:** Neural networks |
|---|---|

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

**Number of ECTS credits:** 5

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

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Recommended literature:**

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 244

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 18.85 | 15.57 | 24.59 | 19.26 | 17.21 | 4.51 |

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

**Date of last modification:** 20.09.2021

**Approved:**

## COURSE INFORMATION LETTER

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

| **Course assessment**<br>Total number of assessed students: 26 | | | | | |
|---|---|---|---|---|---|
| A | B | C | D | E | FX |
| 46.15 | 15.38 | 26.92 | 7.69 | 3.85 | 0.0 |
| **Provides:** RNDr. Peter Gurský, PhD. | | | | | |
| **Date of last modification:** 04.01.2022 | | | | | |
| **Approved:** | | | | | |

## 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:** 5.

**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:** 6.

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

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 5.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 129

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 28.68 | 20.93 | 14.73 | 11.63 | 21.71 | 2.33 |

**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/ PDS1/21 | **Course name:** Parallel and distributed systems |
|---|---|

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 4.

**Course level:** II., N

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

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

**Course assessment**
Total number of assessed students: 47

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 19.15 | 6.38 | 17.02 | 17.02 | 25.53 | 14.89 |

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 90

| abs | n |
|---|---|
| 97.78 | 2.22 |

| |
|---|
| **Provides:** doc. RNDr. Jozef Jirásek, PhD., doc. RNDr. Ondrej Krídlo, 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.

**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:** KPPaPZ/PPZMg/12 | **Course name:** Psychology and Health Psychology (Master´s Study) |
|---|---|

**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:**

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
Conditions for the continuous assessment during the semester:
Active work (maximum 5 points, 2 absences are allowed).
Preparation, presentation and discussion on a selected topic - max. 15 points.
Written examination (maximum 30 points).
Conditions for admission to the exam: min. 25 points.
Conditions for the final assessment:
Exam: written form (max. 50 points, min. 25 points)
Conditions for successful completion of the course: participation in lessons, fulfillment of assignments and at least 66 points from the overall evaluation.
Detailed information in the electronic bulletin board of the course in AIS2. The teaching of the subject will be realized by a combined method.

**Learning outcomes:**
The student will understand the basic concepts and theories of health psychology, can explain salutogenic factors as well as the consequences of risk behavior related to health. He is able to apply the knowledge especially in the field of prevention of burnout syndrome and support of mental health in the work of a teacher.

**Brief outline of the course:**
1 Introduction to health psychology
2 Psychoimmunology
3 Personality factors and health
4 Social support as a protective factor in relation to health
5 Subjective well-being
6 Stress and stressful situations and ways to manage them
7 Burnout syndrome
8 Health-promoting behavior, mental hygiene
9 Health risk behavior
10 School as an important factor of health

**Recommended literature:**
Křivohlavý, J.: Psychologie zdraví. Portál, Praha 2001.

Křivohlavý, J.: Psychologie nemoci. Grada, Praha, 2002.
Křivohlavý, J.: Psychologie moudrosti a dobrého života. Grada, Praha, 2009.
Kebza, V.: Psychosociální determinanty zdraví. Academia, Praha 2005.
Kahneman, D., Diener, E., Schwarz, N.(Eds), Well-Being. The Foundations of Hedonic Psychology. New York, Russell Sage Foundation, 2003.
Kaplan, R. M.: Zdravie a správanie človeka. SPN, Bratislava 1996.
Sarafino, E. P.: Health Psychology. Biopsychosocial interactions. John Wiley and sons 1994.
Baštecký, J., Šavlík, J., Šimek, J. 1993. Psychosomatická medicína. Praha: Grada
Tress, W., Krusse, J., Ott,J.: Základní psychosomatická péče. Portál, Praha 2008.

**Course language:**
slovak

**Notes:**

**Course assessment**
Total number of assessed students: 226

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 19.47 | 25.22 | 25.66 | 13.27 | 15.93 | 0.44 |

**Provides:** PhDr. Anna Janovská, PhD., Mgr. Lucia Barbierik, PhD.

**Date of last modification:** 07.07.2021

**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:** 2., 4.

**Course level:** I., II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

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

**Course assessment**
Total number of assessed students: 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:** ÚINF/ PPU1a/15 | **Course name:** Running practice |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 203

| abs | n |
|---|---|
| 97.54 | 2.46 |

| |
|---|
| **Provides:** Ing. Miron Kuzma, 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/ PPU1b/15 | **Course name:** Running practice |
|---|---|

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

**Number of ECTS credits:** 3

**Recommended semester/trimester of the course:** 5.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 134

| abs | n |
|---|---|
| 99.25 | 0.75 |

| |
|---|
| **Provides:** Ing. Miron Kuzma, 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/ VHSP/17 | **Course name:** SAP HANA environment computations |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:**

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**
Conditions for continuous evaluation: Active participation in problem solving tasks during classes.
Conditions for final evaluation: Evaluation of student's approach and creativity on solutions of given tasks.

**Learning outcomes:**
Experience with basic SAP HANA ecosystem, experience with system's modules and SAP UI5 application development for SAP HANA.

**Brief outline of the course:**
1. Introduction to in memory computation
2. Comparison of in-memory and traditional SQL
3. HANA basics - administration, monitoring, data persistency, backup, update
4. HANA SQL language
5. HANA Eclipse Studio
6. Procedures, functions, scripts
7. Spatial data
8. HANA XS applications
9. advanced HANA XS applications
10. Streaming data analytics - notifications, patterns
11. Streaming data analytics - client - server application
12. Predictive analytics - machine learning
13. Predictive analytics - HANA libraries and tools

**Recommended literature:**
The SAP HANA reference guide is the main study and technical literature, it is an online source. There may occur some other refence guides as well, depending of the type of the particular task.

**Course language:**
Communication: Slovak, English
Literature: English

**Notes:**

| **Course assessment**<br>Total number of assessed students: 14 | |
|---|---|
| abs | n |
| 100.0 | 0.0 |
| **Provides:** Ing. Miron Kuzma, PhD. | |
| **Date of last modification:** 24.11.2021 | |
| **Approved:** | |

**COURSE INFORMATION LETTER**

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:**

**Course level:** I., II.

**Prerequisities:**

**Conditions for course completion:**
Completion: passed
Condition for successful course completion:
- active participation in line with the study rule of procedure and course guidelines
- effective performance of all tasks- aerobics, water exercise, yoga, Pilates and others

**Learning outcomes:**
Content standard:
The student demonstrates relevant knowledge and skills in the field, which content is defined in the course syllabus and recommended literature.
Performance standard:
Upon completion of the course students are able to meet the performance standard and:
- perform basic aerobics steps and basics of health exercises,
- conduct verbal and non-verbal communication with clients during exercise,
- organise and manage the process of physical recreation in leisure time

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

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

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

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

**Course language:**
Slovak language

**Notes:**

**Course assessment**
Total number of assessed students: 54

| abs | n |
|---|---|
| 11.11 | 88.89 |

**Provides:** Mgr. Agata Dorota Horbacz, PhD.

**Date of last modification:** 29.03.2022

**Approved:**

**COURSE INFORMATION LETTER**

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

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 4., 6.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Recommended literature:**

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 23

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

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

**Date of last modification:** 08.01.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 5

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

**Course level:** I., II.

**Prerequisities:**

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

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

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

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

**Recommended literature:**

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 44

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 22.73 | 22.73 | 18.18 | 18.18 | 18.18 | 0.0 |

**Provides:** doc. RNDr. Jozef Jirásek, PhD., 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:** ÚMV/VKM/10 | **Course name:** Selected topics in mathematics

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak

**Notes:**

**Course assessment**
Total number of assessed students: 94

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 15.96 | 21.28 | 19.15 | 22.34 | 20.21 | 1.06 |

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

| |
|---|
| **Date of last modification:** 08.02.2022 |
| **Approved:** |

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚINF/ SWB/15 | **Course name:** Semantic web |
| **Course type, scope and the method:**<br>**Course type:** Practice<br>**Recommended course-load (hours):**<br>**Per week:** 3 **Per study period:** 42<br>**Course method:** present | |
| **Number of ECTS credits:** 4 | |
| **Recommended semester/trimester of the course:** 2., 4. | |
| **Course level:** II. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Conditions for the final evaluation:<br>presentation of selected SW library or tool of semantic web in from of seminar for schoolmates | |
| **Learning outcomes:**<br>Understanding of semantic web languages RDF, RDFS, OWL, ability to use them in practical semantic web applications, experience with ontology modelling and communication with ontology databases. | |
| **Brief outline of the course:**<br>1. Semantic web - motivation, problems, visions.<br>2. Structured web documents, XML, syntax, programming models DOM, SAX, StAX, namespaces in XML, XPath language, XQuery language. Examples of processing XML in Java.<br>3. Semantic web modelling languages: RDF, RDFS, OWL<br>4. Semantic web query language SPARQL, database RDF4J<br>5. Description logic<br>6. Creation of ontology in modelling tool Protege, reasoning<br>7. Topic Maps language, modelling in tool Ontopia<br>8. Jena linbrary<br>9. DBPedia, Google knowledge graph and thair usage in program | |
| **Recommended literature:**<br>[1]ANTONIOU, Grigoris a Frank van HARMELEN. A semantic web primer. Cambridge: MIT Press, c2008. ISBN 978-0-262-01242-3.<br>[2] BAADER, Franz. The Description Logic Handbook. Theory, Implementation and Applications. 2nd edition, Cambridge University Press, 2010. ISBN 978-0-521150118<br>[3] Project RDF4J. Available online: <http://www.openrdf.org/><br>[4] Project Protege. Available online: <http://protege.stanford.edu/><br>[5] Project Jena. Available online: <http://jena.sourceforge.net/><br>[6] SPARQL langugae documantation. Available online: <http://www.w3.org/TR/rdf-sparql-query/> | |

**Course language:**
Slovak or english

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

**Course assessment**
Total number of assessed students: 50

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

**Provides:** RNDr. Peter Gurský, PhD.

**Date of last modification:** 17.11.2021

**Approved:**

## 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:** 3., 5.

**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:** 2.

**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/SGV1/16 | **Course name:** Seminar on computer graphics and vision |
|---|---|

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

**Number of ECTS credits:** 3

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**

**Learning outcomes:**

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

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 47

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

**Provides:** RNDr. Rastislav Krivoš-Belluš, PhD.

**Date of last modification:** 08.01.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:** ÚINF/PDSI1/15

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

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

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

**Recommended literature:**
According to the topic of diploma thesis.

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 195

| abs | n |
|---|---|
| 95.38 | 4.62 |

**Provides:**

**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/SDI1b/15 | **Course name:** Seminar to diploma theses in informatics |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 5.

**Course level:** II.

**Prerequisities:** ÚINF/SDI1a/15

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

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

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

**Recommended literature:**
According to the topic of diploma thesis

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 175

| abs | n |
|---|---|
| 99.43 | 0.57 |

**Provides:**

**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/SDI1c/15 | **Course name:** Seminar to diploma theses in informatics |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 6.

**Course level:** II.

**Prerequisities:** ÚINF/SDI1b/15

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

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

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

**Recommended literature:**
According to the topic of diploma thesis.

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 159

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:** 08.01.2022

**Approved:**

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** KPPaPZ/SPVKE/07 | **Course name:** Social-Psychological Training of Coping with Critical Life Situations |

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 2.

**Course level:** II.

**Prerequisities:**

**Conditions for course completion:**

**Learning outcomes:**

**Brief outline of the course:**

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 126

| abs | n | z |
|---|---|---|
| 97.62 | 2.38 | 0.0 |

**Provides:** Mgr. Ondrej Kalina, PhD.

**Date of last modification:** 24.06.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 3.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

Content prerequisities: advanced programming skills.

**Course assessment**
Total number of assessed students: 36

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 75.0 | 8.33 | 2.78 | 2.78 | 8.33 | 2.78 |

**Provides:** Mgr. Alexander Szabari, PhD., Mgr. Patrik Pekarčík, RNDr. Róbert Novotný, 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/ PRJm1b/15 | **Course name:** Sofware project |

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

content prerequisities: advanced programming skills

**Course assessment**
Total number of assessed students: 17

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

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

**Date of last modification:** 23.11.2021

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 4.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 21

| abs | n |
|---|---|
| 100.0 | 0.0 |

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 5.

**Course level:** II.

**Prerequisities:**

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 28

| abs | n |
|---|---|
| 85.71 | 14.29 |

**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:** ÚTVŠ/ TVa/11 | **Course name:** Sports Activities I. |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 1.

**Course level:** I., I.II., II.

**Prerequisities:**

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

**Learning outcomes:**
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

**Brief outline of the course:**
Brief outline of the course:
Within the optional subject, the Institute of Physical Education and Sports of Pavol Jozef Šafárik University provides for students the following sports activities: aerobics, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
In the first two semesters of the first level of education students will master basic characteristics and particularities of individual sports, motor skills, game activities, they will improve level of their physical condition, coordination abilities, physical performance, and motor performance fitness. Last but not least, the important role of sports activities is to eliminate swimming illiteracy and by means of a special program of medical physical education to influence and mitigate unfitness.
In addition to these sports, the Institute offers for those who are interested winter and summer physical education trainings with an attractive program and organises various competitions, either at the premises of the faculty or University or competitions with national or international participation.

**Recommended literature:**
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252.
JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308.
KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027.

KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345.
LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902.
SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.
STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**
Slovak language

**Notes:**

**Course assessment**
Total number of assessed students: 14548

| abs | abs-A | abs-B | abs-C | abs-D | abs-E | n | neabs |
|---|---|---|---|---|---|---|---|
| 86.46 | 0.07 | 0.0 | 0.0 | 0.0 | 0.05 | 8.41 | 5.02 |

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

**Date of last modification:** 29.03.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚTVŠ/ TVb/11 | **Course name:** Sports Activities II. |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 2.

**Course level:** I., I.II., II.

**Prerequisities:**

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

**Learning outcomes:**
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

**Brief outline of the course:**
Within the optional subject, the Institute of Physical Education and Sports of Pavol Jozef Šafárik University provides for students the following sports activities: aerobics, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
In the first two semesters of the first level of education students will master basic characteristics and particularities of individual sports, motor skills, game activities, they will improve level of their physical condition, coordination abilities, physical performance, and motor performance fitness. Last but not least, the important role of sports activities is to eliminate swimming illiteracy and by means of a special program of medical physical education to influence and mitigate unfitness.
In addition to these sports, the Institute offers for those who are interested winter and summer physical education trainings with an attractive program and organises various competitions, either at the premises of the faculty or University or competitions with national or international participation.

**Recommended literature:**
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252.
JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308.
KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027.
KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345.

LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902.
SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.
STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**
Slovak language

**Notes:**

**Course assessment**
Total number of assessed students: 13211

| abs | abs-A | abs-B | abs-C | abs-D | abs-E | n | neabs |
|---|---|---|---|---|---|---|---|
| 84.35 | 0.51 | 0.02 | 0.0 | 0.0 | 0.05 | 10.78 | 4.29 |

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

**Date of last modification:** 29.03.2022

**Approved:**

**COURSE INFORMATION LETTER**

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

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 3.

**Course level:** I., I.II., II.

**Prerequisities:**

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

**Learning outcomes:**
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

**Brief outline of the course:**
Within the optional subject, the Institute of Physical Education and Sports of Pavol Jozef Šafárik University provides for students the following sports activities: aerobics, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
In the first two semesters of the first level of education students will master basic characteristics and particularities of individual sports, motor skills, game activities, they will improve level of their physical condition, coordination abilities, physical performance, and motor performance fitness. Last but not least, the important role of sports activities is to eliminate swimming illiteracy and by means of a special program of medical physical education to influence and mitigate unfitness.
In addition to these sports, the Institute offers for those who are interested winter and summer physical education trainings with an attractive program and organises various competitions, either at the premises of the faculty or University or competitions with national or international participation.

**Recommended literature:**
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252.
JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308.
KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027.
KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345.

LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902.
SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.
STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**
Slovak language

**Notes:**

**Course assessment**
Total number of assessed students: 8879

| abs | abs-A | abs-B | abs-C | abs-D | abs-E | n | neabs |
|---|---|---|---|---|---|---|---|
| 88.62 | 0.07 | 0.01 | 0.0 | 0.0 | 0.02 | 4.25 | 7.03 |

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

**Date of last modification:** 29.03.2022

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚTVŠ/ TVd/11 | **Course name:** Sports Activities IV. |
|---|---|

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:** 4.

**Course level:** I., I.II., II.

**Prerequisities:**

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

**Learning outcomes:**
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

**Brief outline of the course:**
Within the optional subject, the Institute of Physical Education and Sports of Pavol Jozef Šafárik University provides for students the following sports activities: aerobics, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
In the first two semesters of the first level of education students will master basic characteristics and particularities of individual sports, motor skills, game activities, they will improve level of their physical condition, coordination abilities, physical performance, and motor performance fitness. Last but not least, the important role of sports activities is to eliminate swimming illiteracy and by means of a special program of medical physical education to influence and mitigate unfitness.
In addition to these sports, the Institute offers for those who are interested winter and summer physical education trainings with an attractive program and organises various competitions, either at the premises of the faculty or University or competitions with national or international participation.

**Recommended literature:**
BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252.
JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308.
KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027.
KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345.

LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902.
SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.
STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

**Course language:**
Slovak language

**Notes:**

**Course assessment**
Total number of assessed students: 5628

| abs | abs-A | abs-B | abs-C | abs-D | abs-E | n | neabs |
|---|---|---|---|---|---|---|---|
| 82.66 | 0.28 | 0.04 | 0.0 | 0.0 | 0.0 | 8.05 | 8.97 |

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

**Date of last modification:** 29.03.2022

**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:** 4.

**Course level:** I., II.

**Prerequisities:**

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

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

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

**Recommended literature:**

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

**Course language:**
Slovak or english

**Notes:**

**Course assessment**
Total number of assessed students: 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:** ÚTVŠ/ LKSp/13 | **Course name:** Summer Course-Rafting of TISA River |

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

**Number of ECTS credits:** 2

**Recommended semester/trimester of the course:**

**Course level:** I., II.

**Prerequisities:**

**Conditions for course completion:**
Completion: passed
Condition for successful course completion:
- active participation in line with the study rule of procedure and course guidelines
- effective performance of all tasks: carrying a canoe, entering and exiting a canoe, righting a canoe, paddling

**Learning outcomes:**
Content standard:
The student demonstrates relevant knowledge and skills in the field, which content is defined in the course syllabus and recommended literature.
Performance standard:
Upon completion of the course students are able to meet the performance standard and:
- implement the acquired knowledge in different situations and practice,
- implement basic skills to manipulate a canoe on a waterway,
- determine the right spot for camping,
- prepare a suitable material and equipment for camping.

**Brief outline of the course:**
Brief outline of the course:
1. Assessment of difficulty of waterways
2. Safety rules for rafting
3. Setting up a crew
4. Practical skills training using an empty canoe
5. Canoe lifting and carrying
6. Putting the canoe in the water without a shore contact
7. Getting in the canoe
8. Exiting the canoe
9. Taking the canoe out of the water
10. Steering
a) The pry stroke (on fast waterways)
b) The draw stroke

11. Capsizing
12. Commands

**Recommended literature:**
1. JUNGER, J. et al. Turistika a športy v prírode. Prešov: FHPV PU v Prešove. 2002. ISBN 8080680973.
Internetové zdroje:
1. STEJSKAL, T. Vodná turistika. Prešov: PU v Prešove. 1999.
Dostupné na: https://ulozto.sk/tamhle/UkyxQ2lYF8qh/name/Nahrane-7-5-2021-v-14-46-39#!ZGDjBGR2AQtkAzVkAzLkLJWuLwWxZ2ukBRLjnGqSomICMmOyZN==

**Course language:**
Slovak language

**Notes:**

**Course assessment**
Total number of assessed students: 209

| abs | n |
|---|---|
| 37.32 | 62.68 |

**Provides:** Mgr. Dávid Kaško, PhD.

**Date of last modification:** 29.03.2022

**Approved:**

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚINF/ SLO1a/15 | **Course name:** Symbolic logic |
| **Course type, scope and the method:**<br>**Course type:** Lecture / Practice<br>**Recommended course-load (hours):**<br>**Per week:** 2 / 1 **Per study period:** 28 / 14<br>**Course method:** present | |
| **Number of ECTS credits:** 5 | |
| **Recommended semester/trimester of the course:** 2. | |
| **Course level:** I., II. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Knowledge of studied notions will be evaluated. | |
| **Learning outcomes:**<br>To understand basic notions of symbolic logic. | |
| **Brief outline of the course:**<br>1. Mathematical symbols<br>2. Expressions<br>3. Interpretation<br>4. Value of expression<br>5. Standard interpretation<br>6. Theories and their models<br>7. Substitutions<br>8. Allowed substitutions<br>9. Proving system<br>10. Correctness of basic proving system<br>11. Work with logical connections<br>12. Work with quantifiers | |
| **Recommended literature:**<br>1. Krajči S., https://ics.upjs.sk/~krajci/skola/vyucba/ucebneTexty/logika-stromy.pdf<br>2. Goldstern M., Judah H.: The Incompleteness Phenomenon, A New Course in Mathematical Logic, A K Peters, Wellesley, Massachusetts, 1995 | |
| **Course language:**<br>Slovak | |
| **Notes:** | |

| **Course assessment**<br>Total number of assessed students: 429 | | | | | |
|---|---|---|---|---|---|
| A | B | C | D | E | FX |
| 26.81 | 11.19 | 12.35 | 10.72 | 26.11 | 12.82 |
| **Provides:** prof. RNDr. Stanislav Krajči, 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/SLO1b/15 | **Course name:** Symbolic logic |
|---|---|

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

**Number of ECTS credits:** 5

**Recommended semester/trimester of the course:** 3.

**Course level:** I., II.

**Prerequisities:** ÚINF/SLO1a/15

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

**Learning outcomes:**
Understanding next concepts of symbolic logic.

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

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

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 71

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 28.17 | 14.08 | 25.35 | 4.23 | 11.27 | 16.9 |

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

**Date of last modification:** 17.09.2021

**Approved:**

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚINF/ SPR1a/17 | **Course name:** Systemic programming |

**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:** 2.

**Course level:** I., II.

**Prerequisities:** ÚINF/JAC1/15 and ÚINF/OSY1/21

**Conditions for course completion:**
Final project, oral exam

**Learning outcomes:**
The student will understand principles of GPIO pins, interrupts, low-level communication, clock signal distribution, timers, DMA and buses in a digital integrated circuit. By completing the course, the student will also gain the ability to develop firmware (in programming language C) for embedded devices. Last but not least aim of the course is to implement the "Real Time" operating system (RTOS, specifically FreeRTOS) into ARM microcontroller in order to create secure and efficient firmware reflecting the preemptive nature of tasks in RTOS and their interaction.

**Brief outline of the course:**
Lectures:
1. Explanation of basic terms. Microcontroller (MCU) vs. Microprocessor (CPU).
2. Internet of things - concept, architecture, components. Analog vs. digital signals.
3. Architecture and structure of ARM MCU. Control and status registers.
4. GPIO - concept, implementation, management, functions.
5. Interrupts.
6. Distribution of clock signal in MCU, timers.
7. Low level communication - SPI, I2C.
8. Low level communication - UART, 1-Wire.
9. Analog-digital and digital-analog converters.
10. "Real Time" operating system, FreeRTOS.
11. The task and its life cycle. Preemptive vs. cooperative planning.
12. Synchronization mechanisms.
13. Optimization of operating memory usage.
14. Remote firmware update ([F] OTA).
Exercises:
1. Preparation of development environment, SDK and development tools.
2. First use of development board. Simple firmware development and their deployment.
3. Understanding of the MCU datasheet.
4. Status detection on GPIO pins.

5. Interrupt handlers development.
6. Extended timer and watchdog development.
7. Reading data from sensors via I2C protocol.
8. Communication with MCU via UART protocol.
9. Transformation of analog signal with ADC.
10. Basic deployment of FreeRTOS into MCU development board.
11. FreeRTOS task development and tasks management.
12. Use of synchronization mechanisms to ensure data consistency.
13. Analysis of memory usage of individual task and memory optimization.
14. Firmware over the air update via HTTPs protocol.

**Recommended literature:**

1. ZHU, Yifeng. Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C. Third Edition. New York, United States: E-Man Press, 2017. ISBN 9780982692660.
2. NOVIELLO, Carmine. Mastering STM32. Victoria, British Columbia, Canada: Leanpub. 2018.
3. ESP8266 RTOS SDK Programming Guide. Espressif Documentation [online]. Dostupné z: https://docs.espressif.com/projects/esp8266-rtos-sdk/en/latest/get-started/index.html.
4. The FreeRTOS Reference Manual: API Functions and Configuration Options. FreeRTOS Documentation [online]. 2017. Dostupné z: https://www.freertos.org/Documentation/RTOS_book.html.
5. SILBERSCHATZ, Abraham, Peter B. GALVIN a Greg GAGNE. Operating System Concepts. 10th Revised edition. New York, United States: John Wiley, 2021. ISBN 9781119800361.

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 170

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 56.47 | 20.59 | 14.71 | 0.59 | 7.06 | 0.59 |

**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/ VEP1/21 | **Course name:** Verification and testing of programs |

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

**Number of ECTS credits:** 4

**Recommended semester/trimester of the course:** 4., 6.

**Course level:** II.

**Prerequisities:**

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

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

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

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

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

**Course language:**
Slovak or English

**Notes:**

**Course assessment**
Total number of assessed students: 28

| A | B | C | D | E | FX |
|---|---|---|---|---|---|
| 35.71 | 25.0 | 14.29 | 10.71 | 14.29 | 0.0 |

**Provides:** Mgr. Maroš Dzuriš

**Date of last modification:** 31.01.2022

**Approved:**