Course descriptions

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COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-127/15	Advanced Computer Graphics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAG/2-MPG-101/00 and FMFI.KAG/2-MPG-102/00

Course requirements:
Attend lessons. One missed +0 points. 2 missed 0 points, 3 missed 0 points, 4 and more is Fx.
Project and exercise (mandatory).
Solve all homework problems (mandatory each one >=30%)
Pass final term (mandatory) You will need to solve several problems discussed during lessons.
Pass oral/written exam: (mandatory)
For the semester, the student can get 50% for exercises, 10% bonus, 10% for homework, the final exam consists of a test with weights of 20% and the oral exam is for 20%. The student must solve at least 30% of each homework in order to pass the final written exam. Grading: 92-100 A, 84-91 B, 76-83 C, 68-75 D, 60-67 E. Details on the subject page.
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
After completing the course students will know techniques of photorealistic computer graphics. Will be able to solve color calculation, shadow computation and render views of a scene from the input images. Students learn the basics of graphical programming in C #.

Class syllabus:
LECTURE01 "INTRODUCTION TO COMPUTER GRAPHICS"
LECTURE02 "RAY TRACING 1."
TayTracong Pipeline
LECTURE03 "RAY TRACING 2."
Ray Intersections
LECTURE04 "RAY TRACING 3."
Ray Tracing Acceleration, Data structure: grids, BVH, Kd-tree, Directional Partitioning, Dynamic Scenes, Beam and Cone Tracing, Packet Tracing
LECTURE05 "LIGHT TRASPORT."
Physics behind ray tracing, Physical light quantities, Visual perception of light, Light sources, Light transport simulation: Rendering Equation

LECTURE06 "RADIOSITY."
Diffuse reflectance function, Radiative equilibrium between emission and absorption, escape, System of linear equations, Iterative solution Neuman series
LECTURE07 "BRDF."
Bidirectional Reflectance Distribution Function (BRDF), Reflection models, Projection onto spherical basis functions, Shading Phong model, Blin-Phong model
Physical BRDF, Ward Reflection Model, Cook-Torrance model
LECTURE08 "SHADOWS."
LECTURE09 "TEXTURING 1, 2."
Texture parameterization, Procedural methods, Procedural textures, Fractal landscapes, Surface reality techniques
LECTURE10 "IMAGE BASED RENDERING 1."
Plenopticfunction, Panoramas, Concentric Mosaics, Light Field Rendering, The Lumigraph
LECTURE11 "IMAGE BASED RENDERING 2."
Layered Depth Images, View-dependent Texture Mapping, Surface Light Fields, View Morphing
LECTURE12 "ASK ME ANYTHING."
Test problem introduction

Recommended literature:
Moderní počítačová grafika / Jiří Žára ... [et al.]. Brno : Computer Press, 2010
Realistic image synthesis using photon mapping / Henrik Wann Jensen ; Foreword by Pat Hanrahan. Natick : A K Peters, 2001
http://www.sccg.sk/~durikovic/classes/CG2/cg2_syllabus.html

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 16

A	B	C	D	E	FX
18,75	18,75	31,25	6,25	12,5	12,5

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-112/15	Advanced Image Processing

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
It is necessary to obtain at least 90% of the points to obtain A grade, at least 80% of points to grade B, at least 70% of points to grade C, at least 60% to grade D and at least 50% to grade E.
The course assessment consists of three parts: exercises (30%), project (20%) and final exam (50%). Students should get at least 30 points (out of 50) from exercises and project to meet the minimum condition for admission to the final written exam.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Graduates will know the advanced image processing techniques, such as image transformation, filtering, image improvement, advanced segmentation techniques (using active contours - snakes, flood segmentation) etc.

Class syllabus:
Image capture.
Features digital image.
Picture transformation
Methods of image preprocessing, Hough transform
Fourier Transform - DFT, FFT, filters detail
noise Reduction
Mathematical Morphology BW and grayscale
Segmentation. Snake watershed, clustering
improving the image
processing textures

Recommended literature:
Computer Vision: Algorithms and Applications, Richard Szeliski, The University of Washington, 2nd ed. 2021
Image processing, analysis, and machine vision / Milan Sonka, Vaclav Hlavac, Roger Boyle. [Stamford] : Cengage Learning, 2008

Digital image processing / Rafael C. Gonzalez, Richard E. Woods. Beijing : PEARSON; 4th edition, 2018
Image processing : The fundamentals / Maria Petrou, Costas Petrou. Chichester : John Wiley, 2010

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 74

A	B	C	D	E	FX
12,16	22,97	29,73	13,51	5,41	16,22

Lecturers: RNDr. Zuzana Černeková, PhD., Mgr. Dana Škorvánková

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-131/14	Advanced programming in JAVA (JavaEE)

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-AIN-172 Programovanie (4)

Course requirements:
During semester: Exercises and mini projects
Exam: projects
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
Students will get oriented in advanced technologies of Java and JakartaEE: XML and JSON processing, programming, network applications, access to relational databases, mail, security, Servlets, JSF, websocket, JPA, JMS, batch, object-relational mapping, web services SOAP and REST, web applications in Java.

Class syllabus:
- technologies XML and JSON
- client/server networking, master/slave
- java.nio
- relational databases from Java
- simple encryption and signing
- Servlets
- JSF
- Websocket
- JPA
- JMS
- batch
- JAXWS, JAXRS
- web applications in Java

Recommended literature:
Java EE 8 Tutorial

JAVA EE 7 wtih GlassFish 4 Application Server (David Heffelfinger), Packt Publishing 2014
Java EE 7 Essentials (Arun Gupta), O'Reily, 2013
The Java EE 7 Tutorial, vol1, vol2 (Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, Kim Haase, William Markito), Oracle, 2014
Java a XML pro Javu 5 i 6 (Pavel Herout), v knižnici
Sun Certified Enterprise Architect for Java EE, Study Guide, 2nd ed. (Mark Cade, Humphrey Sheil)

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
16,67	11,11	16,67	21,11	28,89	5,56

Lecturers: Mgr. Pavel Petrovič, PhD., RNDr. Peter Borovanský, PhD., doc. RNDr. Zuzana Kubincová, PhD.

Last change: 15.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KI/2-AIN-205/15	Algorithmics for Hard Problems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Recommended prerequisites:
1-AIN-105 Efficient algorithms and compexity OR 1-INF-310 Design of efficient algorithms

Course requirements:
homeworks (28%), midterm (22%), written exam and oral consultation (50%)
To pass the exam, student has to achieve at least 50% on the exam.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the course students will be able to use methods for solving hard algorithmic tasks, particularly approximation algorithms, probabilistic algorithms, and integer linear programming. Students will be able to work with advanced methods for analysis of algorithms.

Class syllabus:
Introduction to approximation algorithms. Inapproximability. Probabilistic algorithms and their complexity. Las Vegas and Monte Carlo. Integer linear programming. Hierarchy of complexity classes. Examples.

Recommended literature:
Introduction to algorithms / Thomas H. Cormen ... [et al.]. Cambridge, Mass. : MIT Press, 2001
Approximation algorithms / Vijay V. Vazirani. Berlin : Springer, 2001
Randomized algorithms / Rajeev Motwani, Prabhakar Raghavan. New York : Cambridge University Press, 1995

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 36					
A	B	C	D	E	FX
27,78	13,89	8,33	22,22	13,89	13,89
Lecturers: doc. Mgr. Tomáš Vinař, PhD., RNDr. Jozef Šiška, PhD., Mgr. Vladimír Boža, PhD.					
Last change: 24.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-235/15	Algorithms of Artificial Intelligence in Robotics

Educational activities:
Type of activities: lecture / laboratory practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: exercises 25%, project 25%
Exam: final test 50%
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will understand methods of Artificial Intelligence that are useful for intelligent robotic systems. They will have a practical hands-on experience with programming real and simulated robotic intelligent systems.

Class syllabus:
Perception and sensor systems, software robotic architectures, space representation and inference, navigation and localization, probabilistic approaches, simulation, artificial life evolutionary algorithms and neural networks in robotics, applications.

Recommended literature:
The robotics primer / Maja J. Matarić. Cambridge, Mass. : MIT Press, 2007
Invitation to topological robotics / Michael Farber. Zürich : European Mathematical Society, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 24

A	B	C	D	E	FX
16,67	37,5	33,33	8,33	0,0	4,17

Lecturers: Mgr. Pavel Petrovič, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-253/15	Answer Set Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites: FMFI.KAI/2-AIN-108/15 - Computational Logic

Antirequisites: FMFI.KAI/1-AIN-617/00

Course requirements:
Continuous assessment: project, homework, paper
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course, students will be able to use Logic Programming and a special ASP approach to solve various problems and understand their theoretical assumptions.

Class syllabus:
Logic program, stable models, non-monotony, explicit negation, boundaries, ASP approach to problem solving, planning and diagnostics, preferences

Recommended literature:
Knowledge representation reasoning and declarative problem solving / Chitta Baral. Cambridge : Cambridge University Press, 2003
Inteligencia ako výpočet / Ján Šefránek. Bratislava : Iris, 2000

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3

A	B	C	D	E	FX
66,67	0,0	33,33	0,0	0,0	0,0

Lecturers: Ing. Alexander Šimko, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-275/21	Application Architectures

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1., 3.

Educational level: II.

Prerequisites:

Course requirements:
Interim evaluation: project
Examination: oral or written examination
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
The aim of the course is to teach students to understand the architectures of real software systems: from traditional architectures of multi-tiered internet / intranet systems, through architectures service-oriented to modern microservice-based architectures and streaming architectures. At the beginning, students will learn to model the architecture of the system using the architectural ceilings of Rozansky and Woods. Then they gradually implement an example of a simple Internet system: from the dynamic presentation layer in the Angular framework of Google, the mobile presentation layer in the Apache Cordova framework, through the application layer in the Microsoft .NET framework to the inclusion in the DevOps environment. Finally, they implement a simple example of a streaming system on the modern Apache Kafka platform.

Class syllabus:
Brief syllabus of lectures:
1. Software system architecture and architectural views.
2. Multilayer architecture of internet / intranet systems.
3. Presentation layer: server pages
4. Presentation layer: client pages
5. Presentation layer in mobile devices.
6. Application layer in JEE.
7. Application layer in .NET
8. SOAP-based web services.
9. Web services based on REST.
10. Service Oriented Architecture (SOA).
11. Microservices.
12. Continuous integration and continuous delivery (DevOps).

13. Introduction to Big Data.
Brief syllabus of the exercise:
1. Modeling of software system architecture in UML language
2. Implementation of the presentation layer in the Angular framework
3. Implementation of the application layer in the .NET framework
4. Implementation of a mobile presentation layer in the Apache Cordova framework
5. Implementation of continuous integration using MS Azure cloud services
6. Implementation of a simple example of streaming architecture on the Apache Kafka platform

Recommended literature:

Základná:
ŠEŠERA, Ľ. – GREC, P. – NÁVRAT, P. Architektúra softvérových systémov: Architektúra internetových systémov a architektúra orientovaná na služby. Bratislava : Nakladateľstvo STU, 2011. 385 s. ISBN 978-80-227-3546-9.
Slajdy z prednášok.
Odporúčaná:
Fowler, M. et al.: Patterns of Enterprise Application Architecture. Addison-Wesley 2003.
Rozanski, N., Woods, E.: Software Systems Architecture: Working with Stakeholders Using Viewpoints and Perspectives. 2nd Edition. Addison-Wesley, 2011.
Hohpe, G., Woolf,B: Enterprise Integration Patterns: Designing, Building and Deploying Messaging
Solutions. Addison-Wesley, 2004.
Lindley, C.: Front-end Developer Handbook 2019.
https://frontendmasters.com/books/front-end-handbook/2019/
Jakarta EE Tutorial (oficiálna dokumentácia Jakarta EE projektu):
https://eclipse-ee4j.github.io/jakartaee-tutorial/
Freeman, A.: Pro ASP.NET Core 3. Develop Cloud-Ready Web Applications Using MVC, Blazor,
and Razor Pages. 8th Edition. Apress 2020.
Zimmermann, O.: Building Service-Oriented Architectures with Web Services. Tutorial. OOPSLA 2008.
Richardson, R.: Microservices Patterns: With Examples in Java. Munning Publications 2019.
Tiež na: https://microservices.io/
Stopford, B.: The Data Dichotomy: Rethinking the Way We Treat Data and Services.
https://www.confluent.io/blog/data-dichotomy-rethinking-the-way-we-treat-data-and-services/
Davis, J., Daniels, R.: Effective DevOps. O'Reilly 2016.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 18

A	B	C	D	E	FX
27,78	33,33	22,22	11,11	5,56	0,0

Lecturers: RNDr. Ľubor Šešera, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-140/20	Architectures of Software Systems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2., 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: midterm
Examination: oral or written examination
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Deeper knowledge of software engineering, architectural styles and patterns, design patterns, creating models and modeling the architectures. After this course students will be able to study and implement styles and patterns, use prefactoring and refactoring to optimize software design.

Class syllabus:
Stručná osnova predmetu:
1. Architectural styles I. (Garlan & Shaw: Abstract Machine, Pipes and Filters, Client-Server, Object Model, Repository, Blackboard)
2. Architectural styles II. (Interpreter, Modern Canonical Compiler, Rule-Based System, Aspect Oriented Architectures, MVC, Mickrokernel)
3. Distributed architectures, CORBA, Service Oriented Architectures.
4. Architectural patterns I (Buschmann: POSA IV: Pattern Oriented Software Architecture for Distributed Computing).
5. Architectural patterns II. (Reactor, Proactor, Requestor, Invoker, Acceptor, Connector, ACT, Facade, Master-Slave, ...)
6. Architectural patterns III (Memento, Context Object, DTO, Adapter, Iterator, Interceptor, ...)
7. Design patterns I (model and source code level, Gamma et al.).
Creational Patterns (Builder, Abstract Factory, Factory method, ...).
8. Design patterns II. Structural Patterns (Bridge, Decorator, Composite, Proxy, ...)
9. Design patterns III. Behavioral Patterns. (Command, Mediator, State, Strategy, Visitor, Observer, ...)
10. From Refactoring to Patterns (Kerievsky).
11. Refactoring and Prefactoring (Fowler, Pugh).

12. UML and its new features. Superstructure, Infrastructure, meta-models, and Object Constraint Language. Consistency and interconnection of models. XMI, HUTN and PlantUML. 3DUML and xDUML.
13. Agile Modeling and development process. Lean Architecture (Coplien).

Recommended literature:

1. Buschmann F. et al.: Pattern-oriented software architecture: a pattern language for distributed computing, Vol. 4. New York : John Wiley & Sons, 2007. BUSCHMANN, F. -- HENNEY, K. -- SCHMIDT, D. Pattern-oriented software architecture: a pattern language for distributed computing, vol. 4. New York : John Wiley & Sons, 2007.
2. Shaw M L., Garlan D.: Software architecture: Perspectives on an emerging discipline. Prentice Hall, 1996. SHAW, M L. -- GARLAN, D. Software architecture: Perspectives on an emerging discipline.
Upper Saddle River : Prentice Hall, 1996.
3. Arlow J., Neustadt I. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design. Addison-Wesley, 2006.
4. Kerievsky J.: Refactoring to Patterns. Addison Wesley, 2008.
5. Gamma E. et al.: Design Patterns. Elements of Reusable Object-Oriented Software. Addison Wesley, 1994.
6. Fowler M.: Refactoring. Improving the Design of Existing Code. Wesley Longmann, 2000.
7. Pugh K.: Prefactoring, O'Reilly, 2005
8. Coplien O. J., Bjornvig G.: Lean Architecture for Agile Software Development. J. Wiley, 2014.
9.
SOMMERVILLE, I. Software engineering. Harlow : Pearson Education Limited, 2004.
ARLOW, J. -- NEUSTADT, I. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design. New Jersey : Addison-Wesley, 2006. 592 p. ISBN 0-321-32127-8.KERIEVSKY, J. Refactoring to Patterns. Boston: Addison Wesley, 2008.
GAMMA, E. -- HELM, R. -- JOHNSON, R. -- VLISSIDES, J. Design Patterns. Elements of Reusable Object-Oriented Software. Boston : Addison Wesley, 1994. 395 p. ISBN 0-201-63361-2.
FOWLER, M. Refactoring. Improving the Design of Existing Code. Boston: Wesley Longmann, 2000.
Pugh K.:Prefactoring, O'Reilly, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 21

A	B	C	D	E	FX
14,29	42,86	14,29	4,76	0,0	23,81

Lecturers: doc. Ing. Ivan Polášek, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-137/15	Artificial Intelligence

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/2-AINa-137/20

Course requirements:
projects, written exam
Scale: A 95%, B 88%, C 79%, D 68%, E 55%
Scale of assessment (preliminary/final): 30/70

Learning outcomes:
After completing the course, students should have a good overview of the theoretical methods used in artificial intelligence. They should be able to use these methods in practice in programming intelligent systems, they should be able to enrich and creatively exploit.

Class syllabus:
1. Short repetition of basic technics in AI: agent, searching, CSP problem, logical agents.
2. Planning I: Basic planning (STRIPS, POP, TOP, graphplan, critical path method), scheduling.
3. Planning II: Planning problems (hierarchical planning, senzorless planning, incremental planning, planning in a case of nondeterministic actions.)
4. Probabilistic methods in UI I: necessary basic concepts (short summary), introduction to Monte Carlo methods, basic examples. Sampling methods in MC, MC in AI (sampling and artificial data, Monte Carlo tree search)
5. Probabilistic methods in UI II: bayesian networks, bayesian inference, examples. Exact and probabilistic inference in bayesian networks: derect and rejection sampling, likehood weighting, how to use bayesian networks in UI (classification, diagnosis)
6. Time series I . Classical time series analysis, trend and periodicity analysis, spectral analysis, stationary time series, nonlinear time series.
7. Time series II. Box Jenkins time series analysis (AR, MA, ARMA models), time series with uncertainity, introduction.
8. Time series III. Time series with uncertainity, markovian processes, filtration, prediction, Vitterbi algorithm, real problem examples, Kálman filter.
9. Decision theory I. Introduction, simple and complex decisions (lottery examples) utility functions. Markov decision problem, optimal policy, value iteration algorithm, Belman equation.

10. Decision theory II. Decision in games, dominant strategy , Nash equilibrium, repeated games, grim trigger a tit for tat analysis. Cooperation in games.
11. Theory of learning I : supervised and unsupervised learning, Learning decision trees, PAC learning, linear models, regression and classification.
12. Theory of learning II : Bayesian learning , naive models, maximum likehood learning and continuous models, Bayesian learning with hidden parameters.

Recommended literature:

Artificial intelligence : A modern approach / Stuart J. Russell, Peter Norvig. Englewood Cliffs : Prentice-Hall, 1995
Artificial intelligence a new synthesis / Nils J. Nilsson. San Francisco : Morgan Kaufmann, 1998

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 99

A	B	C	D	E	FX
29,29	18,18	16,16	18,18	17,17	1,01

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 16.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-267/18	Automatic 3D Model Generation for Ggames, VR/AR a Vfx

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
To obtain an A rating it is necessary to obtain at least 90% of points, to obtain a B rating at least 80% of points, for rating C at least 70% of points, for rating D at least 60% of points and for rating E at least 50% of the points.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The graduate of the course will understand and be able to use advanced methods for creation of 3D models (point cloud, triangular mesh) from photos and videos.

Class syllabus:
Course summary:
Camera geometry, projection matrix, epipolar geometry.
Camera position calculation, camera consensus and result refinement (structure from motion). Practical demonstration.
Creation of a triangular mesh, texture coordinates, and textures from calibrated images (multi-view geometry). Practical demonstration.
Teams formation by a project (automation, localization, VR / AR, …).
Team work on a project in a PC room, brainstorming
Team work on a project in a PC room, brainstorming
Team work on a project in a PC room, brainstorming
Team work on a project in a PC room, brainstorming

Recommended literature:
Richard Hartley and Andrew Zisserman: Multiple View Geometry in Computer Vision second SEdition, Cambridge University Press, March 2004.
o Wolfgang Förstner and Bernhard P. Wrobel: Photogrammetric Computer Vision, Springer International Publishing, Geometry and Computing, Series Volume 11, 2016

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
22,22	33,33	11,11	22,22	0,0	11,11

Lecturers: RNDr. Michal Jančošek, PhD., RNDr. Martin Bujňák, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MPG-246/15	Colour Image Processing

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/2-AIN-273/11

Course requirements:
It is necessary to obtain at least 90% of the points to obtain A grade, at least 80% of points to grade B, at least 70% of points to grade C, at least 60% to grade D and at least 50% to grade E.
The course assessment consists of three parts: exercises (25%), project (25%) and final exam (50%). Students should get at least 30 points (out of 50) from exercises and project to meet the minimum condition for admission to the final written exam.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the subject, the student will master advanced techniques of the colour-image processing.

Class syllabus:
• Color science (human visual system, colorimetry)
• Color models, color quantization, and palette determination.
• Color morphology.
• Edge search (multi-dimensional gradient, vector order statistics)
• Color image filtering (debluring, defocusing, Fast Filtering)
• Color image segmentation and editing (GMM, graph cut, grab cut)
• Convert a color image to grayscale and vice versa
• Color fastness for one (white patch retinex, gray world assumption) and multiple light sources
• Highlights
• Color space mapping
• Multisprectral image acquisition and processing (IR and UV images)

Recommended literature:
• Image processing, analysis, and machine vision / Milan Sonka, Vaclav Hlavac, Roger Boyle. [Stamford] : Cengage Learning, 2008
• Digital image processing / Rafael C. Gonzalez, Richard E. Woods. Beijing : PEARSON; 4th edition, 2018

• Computer Vision: Algorithms and Applications, Richard Szeliski, The University of Washington, 2nd ed. 2021
• Color in computer vision : Fundamentals and applications / Theo Gevers ... [et al.]. Hoboken : Wiley, 2012
• Digital color image processing / Andreas Koschan, Mongi Abidi. Hoboken, N.J. : Wiley, 2008

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
0,0	28,57	57,14	14,29	0,0	0,0

Lecturers: RNDr. Zuzana Černeková, PhD.

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-139/14	Compilers and interpreters

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Active work on practice lessons at which a student solve assigned tasks is required. At least 80% of completed practice lessons are need to be admitted to the final examination. During the final examination, the student solves a test and according to obtained score, he/she receives a grade: A (90%), B (80%), C (70%), D (60%), E (50%) or FX (less than 50%).
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course student is able to analyze, evaluate and programming language design and compiler or interpreter to create a simple programming language.

Class syllabus:
Introduction to programming languages, compilers and interpreters
Virtual machine, code, memory management
Abstract syntax trees and other representations
Lexical analysis
Parsing
Namespaces
Code Generation
Error Handling
Algorithms for compiling language constructs, data structures and expressions

Recommended literature:
[1] Aho, Alfred V. [et al.]: Compilers : Principles, techniques, & tools. Boston : Pearson/Addison-Wesley, 2007
[2] Scott, Michael L.: Programming language pragmatics. Amsterdam ; Boston : Elsevier/Morgan Kaufmann Pub., 2009

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 182					
A	B	C	D	E	FX
34,62	14,84	21,43	8,79	13,19	7,14
Lecturers: doc. RNDr. Ľubomír Salanci, PhD.					
Last change: 15.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-154/12	Complex Networks

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: work in seminars, continuous submission of assignments
Exam: exam
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
Getting acquainted with the issue of complex networks in informatics. Ability to analyze basic models of complex networks and apply them in practice. Ability to work with software to analyze the statistical properties of complex networks.

Class syllabus:
1. Case studies (internet, social networks, functional brain networks..). Náther
2. Graph theory and complex networks. Markošová
3. Lattice and random networks (clustering, shortest distance, centrality....), Eordes, Renyiho theory. Markošová
4. Small world networks – models, navigation on nets, case study. Čajági
5. Scale free networks 1 – Barabási – Albert model, preferential node attachment, case study, variants of BA model. Náther
6. Tools for network analysis (NWB, Navigator). Čajági
7. Scale free networks 2 - Vasquezo model, surfers na network. Markošová
8. Hierarchy in networks, Ravasz Barabasi model, surfers on networks and hierarchy, case study. Náther
9. Socal networks, collaboration networks, cfommunities, clusters, models. Čajági
10. Epidemic networks, netwrks witch synchronicity. Čajági
11. Vizualization of networks, tools, layouts. Náther
12. Vulnerability, stability of nets, risk analysis. Čajági
13. Applications of the complex networks theory (in computer science informatike, biology, sociology, linguisics...). Markošová
14. Student projects. Náther

Recommended literature:

D. J. Watts, Small worlds, Princeton university press, Princeton USA, 2004
M.E.J. Newman, The Structure and Function of Complex Networks, SIAM Review 2003
A. Barat, M. Barthelemy, A. Vespigniani, Dynamical Processes on Complex Networks, Cambridge University Press New York, 2008, ISBN 0521879507

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 30

A	B	C	D	E	FX
26,67	43,33	20,0	10,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-108/15	Computational Logic

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Semester:
- labs activity 10p (min 5p)
- homework 10p (min 5p)
- midterm 10p
- project 30p (min 15p)

Exam:
- oral exam 40p (min 20p)

Scale of assessment (preliminary/final): 60/40

Learning outcomes:
The course is concerned with problem solving by methods of computational logic, relying on modelling and automated inference. Students become acquainted with problem modelling in classical logic (SAT), and in logic programming (Prolog, ASP). The course focusses on the representational power of different formalisms and on algorithmic aspects (reasoning algorithms, their soundness and completeness). Students will get an overview of different implementations of reasoning algorithms, and practical experience with their usage.

Class syllabus:
- Classical propositional logic (recap)
- Encoding problems into SAT, using SAT sovlers
- Logic programming (syntax, SLDNF resolution, stable models)
- Encoding problems into logic programs, using LP solvers (Prolog, ASP)

Recommended literature:
Biere, A., Heule, M. and van Maaren, H. eds., 2009. Handbook of satisfiability (Vol. 185). IOS press.
Björk, M., 2011. Successful SAT encoding techniques. Journal on Satisfiability, Boolean Modeling
and Computation, 7(4), pp.189-201.

Sterling, L. and Shapiro, E.Y., 1994. The art of Prolog: advanced programming techniques. MIT press.
Baral, C., 2003. Knowledge representation, reasoning and declarative problem solving. Cambridge
university press.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 73

A	B	C	D	E	FX
8,22	12,33	17,81	17,81	16,44	27,4

Lecturers: doc. RNDr. Martin Homola, PhD., Mgr. Júlia Pukancová, PhD.

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-222/00	Computer Graphics Aplications

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
presentations
A 92%, B 84%, C 76%, D 68%, E 60
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will have knowledge of successful design projects and new trends in the application of methods and means of computer graphics.

Class syllabus:
1. Project presentations according to the project report distributed to the students
2. Projects and results done at the department
3. New trends and applications of computer graphics techniques.

Recommended literature:
J. Žára, B. Beneš, P. Felkel, Moderní počítačová grafika, Computer Press, Praha 1998
Project report from journal IEEE Computer and Graphics Applications
http://www.computer.org/portal/web/computingnow/cga
Internet

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 185

A	B	C	D	E	FX
50,81	14,05	17,3	7,03	6,49	4,32

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-147/19	Computer Vision

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI+KAG/2-MPG-125/15

Course requirements:
Assessment: evaluation Preliminary assessment: Continuous assessment projects Final assessment: assessment examination A 90%; B 80%; C 70%; D 60%; E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Graduates will know the advance techniques of machine vision, image recognition and processing, such as feature extraction from images, face detection and tracking, identification of significant areas in the image, etc.

Class syllabus:
Image Features extraction (Low, Medium and High level features)
Feature categories and application(Shape, Color, Texture...)
Object detection (Template matching, histogram of oriented gradients, Face detection and classification)
Local features (detectors, descriptors, matching, Ransac, Bag of visual words)
Dynamic Range of images, Tone Mapping a Gamut mapping
Image Quality metrics (SSIM and modifications)
Eye tracking (methods and applications)
Machine Vision and industry applications of computer vision (Laser line triangulation sensors, multispectral imaging)
Object Tracking (Tracking by detection, Optical flow)

Recommended literature:
Feature extraction : Foundations and applications / Isabelle Guyon ... [et al.] (eds.). Berlin : Springer, 2006 Algorithms for image processing and computer vision / J. R. Parker. New York : Wiley, 1997 Shape classification and analysis : Theory and practice / Luciano da Fontoura Costa, Roberto Marcondes Cesar, Jr.. Boca Raton, Fla. : CRC Press, 2009 Elena Šikudová, Zuzana Černeková, Vanda Benešová, Zuzana Haladová, Júlia Kučerová: Počítačové videnie. Detekcia a rozpoznávanie objektov, vydavateľstvo Wikina, Praha, ISBN: 978-80-87925-06-5

Languages necessary to complete the course:
Slovak and English

Notes:

Past grade distribution
Total number of evaluated students: 30

A	B	C	D	E	FX
26,67	13,33	16,67	10,0	30,0	3,33

Lecturers: RNDr. Zuzana Berger Haladová, PhD.

Last change: 27.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-233/00	Computer Vision Applications

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-AIN-112/15
or
2-MPG-125/15

Course requirements:
Presentations and activity on lectures
A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completing the course students will be able to discover, develop and analyze the latest practices of successful projects in the field of computer vision and apply new trends in computer vision to create their own applications.

Class syllabus:
1. Case studies of successful applications.
2. Industrial applications.
3. Medical applications.
3. Other applications.
4. Results of departmental research projects.
5. New trends in application of computer vision methods and techniques.

Recommended literature:
Computer Vision and Image Understanding, Elsevier Inc., http://www.sciencedirect.com/science/journal/10773142
International Journal of Computer Vision Springer http://www.springerlink.com/content/0920-5691
IET Computer Vision http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=4159597
CVPR - Computer Vision and Pattern Recognition Workshops http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=5521877

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 265

A	B	C	D	E	FX
49,43	23,4	10,94	1,51	5,28	9,43

Lecturers: RNDr. Zuzana Černeková, PhD.

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-145/15	Creating Internet Applications

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Project, written and oral exam with practical component.
Approximate grading scale: A 94%, B 88%, C 81%, D 75%, E 69%.
More detailed information is available on the website.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be able to implement internet applications using selected modern technologies, software engineering practices and complex application framework.

Class syllabus:
Selected modern technologies: client-side scripting (JavaScript, jQuert), raster (canvas) and vector (SVG, D3) client-side graphics rendering, two-way communication between the server and the client (WebSockets). Complex application framework (e.g. React). Security of internet applications.

Recommended literature:
Douglas Crockford. JavaScript: The Good Parts: The Good Parts. O'Reilly Media, 2008, ISBN-13: ‍978-0596517748.
Vanessa Wang, Frank Salim, Peter Moskovits. The Definitive Guide to HTML5 WebSocket. Apress, 2013, ISBN-13: ‍978-1430247401.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 189

A	B	C	D	E	FX
18,52	15,34	22,22	16,93	13,76	13,23

Lecturers: RNDr. Richard Ostertág, PhD., Mgr. Askar Gafurov, PhD.

Last change: 22.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-136/15	Creation of Educational Software

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
evaluation of stage: design, develepment and testing the educational software
oral exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Student, teacher according to the requirements of practice, designs and develops educational software. Its development work in a team with one or two colleagues. Program design and test control in four stages. The result of the last stage of the operational program. Software develops methods action research (Design-Based Research). Student wrote a user manual for teachers.

Class syllabus:
Cooperation between the teacher (client) and the programmer of educational software, UML as a tool for their communication.
Requirements for educational software for teaching a specific topic at primary, secondary or university - interactivity, multimedia, openness of the software (settings, tasks, pictures, editor for teachers, student registration, tables and diagrams of student evaluation ...).
Software development in four stages. Evaluation of software from the perspective of teachers and students - software development by action research methods.
Desktop programs vs. web applications vs. mobile applications in the development and use of educational software. Platform independence of educational software.

Recommended literature:
Premeny školy v digitálnom veku / Ivan Kalaš a kolektív. Bratislava : Slovenské pedagogické nakladateľstvo - Mladé letá, 2013
T. Plomp, N. Nieveen et al. Educational Design Research. Slo 2013
vlastné elektronické texty zverejňované na webovej stránke, resp. v prostredí Moodle

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 48

A	B	C	D	E	FX
50,0	10,42	22,92	10,42	2,08	4,17

Lecturers: doc. PaedDr. Monika Tomcsányiová, PhD., Mgr. Lucia Budinská, PhD.

Last change: 16.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-225/15	Creation of Multimedia Applications and Computer Games

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Active work on practice lessons at which a student solve assigned tasks is required. At least 80% of completed practice lessons are need to be admitted to the final examination. During the final examination, the student solves a test and according to obtained score, he/she receives a grade: A (90%), B (80%), C (70%), D (60%), E (50%) or FX (less than 50%).
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
After completing the course student is able to analyze, evaluate, design and create a simple game engine and multimedia applications.

Class syllabus:
Creation of interactive multimedia applications and computer games.
Representation of game objects and worlds.
Real time algorithms for motion, interaction and rendering video games in real time.
Algorithms for intelligent behaviour and solving strategic problems in video games.
Literature.

Recommended literature:
[1] Gregory, Jason: Game Engine Architecture. A K Peters/CRC Press 2018. ISBN 9781138035454
[2] Schell, Jesse: The Art of Game Design. CRC Press, 2019. ISBN: 9781138632059

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 178

A	B	C	D	E	FX
28,09	14,61	15,17	19,66	14,61	7,87

Lecturers: doc. RNDr. Ľubomír Salanci, PhD.
Last change: 15.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KI/2-INF-188/17	Current Approaches in Machine Learning

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
ongoing evaluation: homework, project
estimated grading curve: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
After completion of the course, students will be able to train modern architectures of neural networks, and efficiently use the scientific literature from this field.

Class syllabus:
Problems in neural network training (vanishing gradient, ...) and their solutions (Xavier's initialization,...); New architectures of neural networks (LSTM, GRU, GAN, Relu activation,...); Reinforced learning in neural networks; Current practical applications from literature

Recommended literature:
Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep learning. MIT press, 2016.; Papers from conferences NIPS, ICLR, ICML.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 27

A	B	C	D	E	FX
62,96	14,81	0,0	0,0	11,11	11,11

Lecturers: Mgr. Vladimír Boža, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-291/15	Data Warehousing

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
sufficient points earned during the semester
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The students will have an overview about the field of Data Warehousing, and its subareas. They will have a complex understanding of the area. Students will gain a theoretical knowledge in the area of the design of Data Warehouses, ETL processes, and report creation. While working with the tools of contemporary data warehousing industrial design practice, the students will obtain practical skills.

Class syllabus:
- Introduction to the field of Data Warehousing
- The most common types of SQL queries used in the context of data warehouses
- Principles, methods, and specifics of dimensional modeling and the differences from a relational modeling
- Designing logical and physical models using a modeling tool
- Using physical database structures and special methods (partitions, indexes, star transformations)
- Introduction to the DataStage tool
- Working with metadata
- Using data resources (database connections, files, etc.)
- Parallel and sequential jobs
- Partitions in the context of ETL processes
- Methods for data processing with ETL processes (transformations, aggregations, join, merge, lookup, sorting, duplicates removal, etc.)
- Design patterns (Slowly changing dimensions)
- Methods used in ETL processes design
- Data lineage
- Design of ETL processes
- Creating reports
- Principles and design of mutidimensional models (Cubes)

- Overview of advanced methods for data processing in data warehouses: Predictive analysis tools (SPSS), cognitive tools (Watson)

Recommended literature:

Christopher Adamson, The Star Schema, Complete Reference, 510p., McGraw-Hill Osborne Media; 1 edition (July 7, 2010), ISBN: 978-0071744324

Ralph Kimball, The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling , Wiley; 2 edition (April 26, 2002), ISBN: 978-0471200246

IBM Redbooks, IBM Infosphere Datastage Data Flow and Job Design, 616p. Vervante (July 7, 2008), ISBN: 978-0738431116

Languages necessary to complete the course:

Notes:

Past grade distribution

Total number of evaluated students: 21

A	B	C	D	E	FX
76,19	9,52	4,76	0,0	9,52	0,0

Lecturers: Mgr. Radoslav Golian, PhD.

Last change: 17.09.2018

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-266/17	Declarative Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary assessment: homeworks, tests.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To give mathematical foundations of declarative programming languages.

Class syllabus:
1. Primitive Recursive Functions. Basic functions and operations. Explicit definitions. Bounded minimalization. Pairing function and arithmetization. Recursion with substitution in parameters. Nested simple recursion. Recursion with measure. Regular recursive definitions.
2. General Recursive Functions. Beyond primitive recursion: Ackermann-Péter function, universal function for primitive recursive functions. Primitive recursive indices. Transfinite recursion. General recursive functions. Regular minimalization. μ-Recursive functions.
3. Partial Recursive Functions. First recursion theorem (fixed point theorem). Computation model. Equivalence of the operational and denotational semantics. Partial recursive functions. Unbounded minimalization. Arithmetization of computation. Kleene normal-form theorem. Universal function. Recursive indices. Enumeration theorem. Partial μ-recursive functions. Church thesis. Recursively decidable, semidecidable and undecidable problems.

Recommended literature:
[1] Recursive Functions / Ján Komara. Online.
[2] Úvod do teórie algoritmov / Ivan Korec. Bratislava : Univerzita Komenského, 1983.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
0,0	0,0	50,0	50,0	0,0	0,0

Lecturers: Ing. Ján Komara, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-268/19	Deep learning for computer vision

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 32

A	B	C	D	E	FX
25,0	31,25	12,5	12,5	9,38	9,38

Lecturers: RNDr. Zuzana Černeková, PhD., Ing. Viktor Kocur, PhD.

Last change: 06.05.2019

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-269/19	Deep learning for computer vision labs

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 25

A	B	C	D	E	FX
28,0	12,0	4,0	12,0	12,0	32,0

Lecturers: Ing. Viktor Kocur, PhD.

Last change: 06.05.2019

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-283/00	Development of Critical Applications

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: exercises
Exam: exam
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Graduates will have personal experience with the use of formal methods in the specification and verification of selected (critical) applications.

Class syllabus:
The course follows the course Formal methods of software development, in which students got acquainted with the basic models for formal specification of systems (Process algebras, Petri nets, Time automata), with various logical calculations (especially based on modal and temporal logic) that are used for formal specification of system properties and model checking issues. In a series of practical critical applications (with emphasis on various communication protocols), students will learn to use these techniques - to specify the application and its formal description and verify whether the application meets it. They will use available model-checking software tools in their teaching. Within this subject, they themselves, with the help of a teacher, choose a suitable "critical" application and subsequently a suitable formalism for its specification and verification. Over the course of several iterations, they will improve, supplement and expand their solutions so that in the end they have personal experience with the deployment of formal methods.

Recommended literature:
Milner, R.: Communication and concurrency. Prentice-Hall
International, New York, 1989.
Reisig, W.: A Primer in Petri Net Design. Springer-Verlag, 1992
Jan A. Bergstra, Alban Ponse, and Scott A. Smolka, Editors. Handbook of Process Algebra, Elsevier, 2001.
Stirling C.: Modal and Temporal Properties of Processes, Springer (Texts in Computer Science), 2001

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 23

A	B	C	D	E	FX
91,3	4,35	4,35	0,0	0,0	0,0

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-272/15	Digital Signal Processing

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: problem solving
Exam: practical, written, oral
Indicative assessment scale: A 92%, B 84%, C 76%, D 68%, E 60%

Learning outcomes:
Students acquire theoretical and practical knowledge with the processing of discrete (sampling analog) one dimensional signals using a computer. The acquired knowledge can be used in real-world applications such as audio processing, measurement sensors, signal transmission ... In the exercises students gain the appropriate skills to work in an environment Octave (freely distributable compatible alternative to Matlab).

Class syllabus:
Discrete signal
Discrete random signal
Discrete Fourier Transform (DFT)
Window functions and their influence on DFT properties
Z-transformation
Discrete linear time-invariant (LTI) systems
Digital IIR filters
Digital FIR filters
Detection and estimation
Power Spectral Density (PSD)
Parametric PSD
Wavelet transform

Recommended literature:
Springer handbook of speech processing / Jacob Benesty, M. Mohan Sondhi, Yiteng Huang (Eds.). Berlin : Springer, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 126

A	B	C	D	E	FX
33,33	16,67	15,08	9,52	16,67	8,73

Lecturers: RNDr. Marek Nagy, PhD.

Last change: 20.06.2022

Approved by:

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAI/2-AIN-991/15	**Course title:** Diploma Thesis
Number of credits: 16	
Educational level: II.	
Prerequisites: FMFI.KAI/2-AIN-923/15 - Project Seminar (1) and FMFI.KAI/2-AIN-924/15 - Project Seminar (2)	
State exam syllabus:	
Last change: 29.05.2020	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-138/16	Discrete Structures in Informatics and Computer Graphics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Examination: an examination consisting of a written and an oral part
Continuous assessment: project, test The student must obtain at least 55% of points from the semester in order to take the final exam.
Indicative rating scale: A 90%, B 80%, C 70%, D 60%, E 50%
Weight of the mid-term / final evaluation: 50/50
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Theoretical foundations, methods and tools from Algebra and Discrete structures used in Informatics and Computer Graphics with examples and practical applications.

Class syllabus:
1) Selected chapters from elementary number theory, primality tests.
2) Modular arithmetic, congruences, Fermat's Little Theorem, Euler's Theorem
3) Algebraic structures: groups, rings, finite fields - practical examples
4) Orders of an element and of a group, primitive roots
6) Number systems: congruences, fast modular exponentiation,
7) Chinese Remainder Theorem, solving systems of linear congruences, application: error detecting and error-correcting codes
8) Pseudo-random numbers: the linear congruential generator
9) Matrix algebra, linear transformations
5) Quaternions
10) Modular matrices, application: Hill's cryptosystem
11) Determinants, application: Vandermond's determinant – secret sharing
12) One-way functions, discrete logarithm, one-way functions in algebraic structures
13) Applications of groups, finite fields, congruences: RSA cryptosystem, Knapsack cryptosystem,
14) Mathematical concept of symmetry: groups of automorphisms, isomorphisms, permutations

Recommended literature:
[1] Stanoyevitch, A. (2011) Discrete Structures with Contemporary Applications, CRC Press.

[2] Gersting, J.L. (2007) Mathematical Structures for Computer Science, 6th edition, W.H.Freeman and Company, NY.
[3] Gallian, J.A. (2012) Contemporary Abstract Algebra, 8th edition, Brooks/Cole, Boston
[4] Cormen, T.H. - Leiserson, C.E. - Rivest, R.L.- Stein,C. (2009) Introduction to Algorithms, 3nd edition, The MIT Press.
[5] Yamamura, A. - Jajcayová, T. - Kurokawa, T. (2005) Oblivious transfer and private information retrieval using homomorphic encryption functions, In: Proceedings of the 2005 Symposium on Cryptography and Information Security, Vol. 1. - Tokyo
[6] Jajcayová, T. (2019): Representations of permutation groups and semigroups on combinatiorial structures
In: Fifth Russian Finnish Symposium on Discrete Mathematics. S. 137-145. - ISBN 978-5-89896-704-8

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 34

A	B	C	D	E	FX
38,24	17,65	14,71	8,82	14,71	5,88

Lecturers: doc. RNDr. Tatiana Jajcayová, PhD.

Last change: 26.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-234/15	E-learning Environments in Education

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-AIN-224 Webové programovanie

Course requirements:
Intermediate assessment: practical assignments (25%), reviews (33%), project
Exam: practical
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60 / 40

Learning outcomes:
The student is able with respect to the specified educational requirements a) assess the various e-learning environments, b) specifies the requirements for e-learning environment, c) select the appropriate e-learning environment, respectively. suggest and implement new environment or a new module into the existing environment.

Class syllabus:
Overview, comparison, assessment and analysis of various e-learning environments, environments and systems for learning objects, school information systems.
Creating a specification of requirements for the educational environment.
Design and / or implementation of a module into an existing e-learning environment.
Current trends in e-learning.

Recommended literature:
Web- based training : Creating e-Learning experiences / Margaret Driscoll. San Francisco : Jossey-Bass , 2002
Own electronic texts published on the website, resp. in the Moodle environment.

Languages necessary to complete the course:
Slovak, English

Notes:
The course will start with a minimum number of students 3.

Past grade distribution Total number of evaluated students: 42					
A	B	C	D	E	FX
61,9	16,67	16,67	2,38	2,38	0,0
Lecturers: PaedDr. Roman Hrušecký, PhD.					
Last change: 21.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-130/21	Elements of AI

Educational activities:
Type of activities: independent work
Number of hours:
per week: 25 **per level/semester:** 325
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Passing the online course https://course.elementsofai.com/ (in Enlish or Slovak version).

Learning outcomes:
The student will get acquainted with selected basic concepts of artificial intelligence and their use in solving various practical tasks.

Class syllabus:
1. What is artificial intelligence: related areas, AI philosophy.
2. Troubleshooting and UI: Browsing and troubleshooting, browsing and games
3. Probability and chance, Bayes' theorem, naive Bayesian classification.
4. Machine learning: nearest neighbor classifier, regression.
5. Neural networks: basics, creation, modern techniques.
6. Consequences: on predicting the future, the effects of AI on society, summary.

Recommended literature:
Russell S., Norwig P. (2010). Artificial Intelligence: A Modern Approach, (3rd ed.), Prentice Hall. Available in faculty library.
Marsland S. (2015). Machine Learning: An Algorithmic Perspective, (2nd ed.), CRC Press.

Languages necessary to complete the course:
Slovak or English

Notes:
The course consists of 20 numerical and 5 text-based tasks. Numerical tasks are checked automatically, text-based tasks are evaluated anonymously by students.

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-MXX-130/21	Elements of AI

Educational activities:
Type of activities: independent work
Number of hours:
per week: 25 **per level/semester:** 325
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Passing the online course https://course.elementsofai.com/ (in Enlish or Slovak version).

Learning outcomes:
The student will get acquainted with selected basic concepts of artificial intelligence and their use in solving various practical tasks.

Class syllabus:
1. What is artificial intelligence: related areas, AI philosophy.
2. Troubleshooting and UI: Browsing and troubleshooting, browsing and games
3. Probability and chance, Bayes' theorem, naive Bayesian classification.
4. Machine learning: nearest neighbor classifier, regression.
5. Neural networks: basics, creation, modern techniques.
6. Consequences: on predicting the future, the effects of AI on society, summary.

Recommended literature:
Russell S., Norwig P. (2010). Artificial Intelligence: A Modern Approach, (3rd ed.), Prentice Hall. Available in faculty library.
Marsland S. (2015). Machine Learning: An Algorithmic Perspective, (2nd ed.), CRC Press.

Languages necessary to complete the course:
Slovak or English

Notes:
The course consists of 20 numerical and 5 text-based tasks. Numerical tasks are checked automatically, text-based tasks are evaluated anonymously by students.

Past grade distribution
Total number of evaluated students: 37

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Mária Markošová, PhD.

Last change: 22.08.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-233/13	English Conversation Course (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1., 3.

Educational level: I., II.

Prerequisites:

Course requirements:
tests, presentations, essays
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Continual improvement of all language skills focused on communication/speaking, listening comprehension and writing. The emphasis is on discourse, lexicology and morphology, word-bank broadening of communicational English as well as English for specific purposes appropriate for university students. This course is a follow up of the previously taught ESP course.

Class syllabus:
This course's focus is to broaden spoken/communicational English for students with B2/C1 level of English knowledge.

Recommended literature:
Appropriate study material is supplied based on the participants'level of English by the lecturer. (Sources- The Guardian, The Herald Morning Sun. The Nine News, The West Australian, BBC News and podcasts, CNN podcasts).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 215

A	B	C	D	E	FX
67,44	13,02	6,51	1,86	1,4	9,77

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-234/13	English Conversation Course (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2., 4.

Educational level: I., II.

Prerequisites:

Course requirements:
tests, oral presentations, essays
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Continual improvement of all language skills focused on communication/speaking, listening comprehension and writing. The emphasis is on discourse, lexicology and morphology, word-bank broadening of communicational/spoken English as well as English for specific purpose appropriate for university students. This course is a follow up of the Conversational English course 1.

Class syllabus:
This course's focus is to broaden spoken/communicational English for students with B2/C1 level of English knowledge(Upper-Intermediate/Lower Advanced).

Recommended literature:
Appropriate study material is supplied based on the participants'level of English by the lecturer. (Sources- The Guardian, The Herald Morning Sun. The Nine News, The West Australian, BBC News and podcasts, CNN podcasts).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 146

A	B	C	D	E	FX
77,4	12,33	3,42	1,37	0,0	5,48

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-181/00	Evolutionary Algorithms

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: elaboration of projects for exercises
Exam: exam
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To acquaint students with basic methods of evolutionary algorithms. To show the problems that can be solved with them, to point out the advantages and disadvantages of individual types of evolutionary algorithms and their suitability for solving those optimization problems. To teach students to practically solve such problems on the basis of developed projects.

Class syllabus:
(1) Optimization problems and their solutions. Biological inspiration for evolutionary algorithms.
(2) Darwin's evolution as an algorithm, coding, local search.
(3) Genetic algorithm, genetic programming, theoretical foundations, use to solve combinatorial problems.
(4) Evolutionary strategy method, simulated annealing method.
(5) More complex evolutionary algorithms.
(6) Artificial life.

Recommended literature:
Introduction to evolutionary computing / A. E. Eiben, J. E. Smith. Berlin : Springer, 2003
Evolučné algoritmy / Vladimír Kvasnička, Jiří Pospíchal, Peter Tiňo. Bratislava : Slovenská technická univerzita, 2000

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 69					
A	B	C	D	E	FX
30,43	18,84	23,19	14,49	7,25	5,8
Lecturers: doc. RNDr. Mária Markošová, PhD.					
Last change: 18.11.2021					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-133/15	Extreme Programming

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Recommended prerequisites:
No

Antirequisites: FMFI.KAI/1-AIN-680/00

Course requirements:
Continuing evaluation: homework assignments (40%)
Exam: written with oral consultation (35%)
Project: (25%)
To successfully complete the course, student has to obtain at least 60% of points on the final exam
Final grade: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
After completing the course, students will be able to use the methods and techniques Agile Extreme Programming methodology. It will be the pair programming, different techniques of use and test, test driven programming, refactoring, techniques of working with legacy code. They will be able to organize work on a collective project by project management methodology in the form of extreme programming.

Class syllabus:
History of software engineering, life cycle of software systems, traditional methodologies and agile methodologies, pillars of extreme programming (XP), pairwise programming, test driven programming, typology of tests and their use, refactoring and its techniques, principles of writing clean code, working with inherited code, principles of project management in XP - planning, development, design, testing. Design and creation of your own group project.

Recommended literature:
Langr, Jeff, 2013: Modern C++ Programming with Test-Driven Development, The Pragmatic programmers, LLC
Amr Noaman, 2018: Refactoring to Clean Code. Concepts and Techniques for Taming Wild Code, The

Pragmatic Bookshelf, Dallas, http://leanpub.com/RefactoringToCleanCode
Feathers, Michael C, 2005: Working Effectively with Legacy Code, Prentice Hall
Bernstein, David Scott, 2015: Beyond Legacy Code, Nine Practices to Extend the Life (and Value) of Your
Software, The Pragmatic Bookshelf, Dallas, Texas – Raleigh, North Carolina
Whittaker, James A., 2011, Exploratory Software Testing, Addison-Wesley

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 208

A	B	C	D	E	FX
65,38	11,06	9,62	3,85	7,69	2,4

Lecturers: Ing. František Gyarfaš, CSc.

Last change: 24.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-185/00	Formal Methods of Software Development

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
all homeworks as well as two written test during semester has to be completed
A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
Graduates of this subject will know the basic models, the formalisms and techniques used in formal specification and verification of methods.

Class syllabus:
Students will learn some basic models exploited in formal specifications of systems (Process Algebras, Petri nets, Timed Automata ..), their syntax and semantics which are suitable for different applications in formal specifications. Also some modal and temporal logics which are exploited in systems specifications will be tought together with some basics on model checking.

Recommended literature:
Milner, R.: Communication and concurrency. Prentice-Hall
International, New York, 1989.
Reisig, W.: A Primer in Petri Net Design. Springer-Verlag, 1992
Jan A. Bergstra, Alban Ponse, and Scott A. Smolka, Editors. Handbook of Process Algebra, Elsevier, 2001.
Stirling C.: Modal and Temporal Properties of Processes, Springer (Texts in Computer Science), 2001

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 509

A	B	C	D	E	FX
22,59	13,16	18,86	24,95	18,66	1,77

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-141/00	French Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
French language is taught at two levels: beginner and intermediate. Students opt for one of them depending on whether they wish to obtain the fundamentals of the language or wish to maintain and/or improve previous knowledge of French.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 435

A	B	C	D	E	FX
45,75	20,0	18,85	8,74	2,3	4,37

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-142/00	French Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject continues the program of French language (1) and provides courses of essential and intermediate French language.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 265

A	B	C	D	E	FX
38,87	25,28	19,62	10,19	2,64	3,4

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-241/00	French Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject provides a course of intermediate French language, covering not only general, but also technical language.

Recommended literature:
Capelle Guy, Menand Robert: Le Nouveau taxi 1, Hachette FLE Paris, France 2009, ISBN 978-2-01-155548 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 104

A	B	C	D	E	FX
39,42	27,88	21,15	6,73	0,96	3,85

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-242/00	French Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
The subject provides a course of intermediate French covering not only general, but also technical French language.

Recommended literature:
Menand Robert: Le Nouveau taxi 2, Hachette FLE, Paris, France 2009, ISBN 978-2-01-155551 - 9

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 74

A	B	C	D	E	FX
41,89	32,43	17,57	2,7	1,35	4,05

Lecturers: Mgr. Ľubomíra Kožehubová

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-116/14	Functional Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
homeworks, written exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
students will know what is functional programming, basics of lambda calculus and advanced technology functional programming

Class syllabus:
Functional pearls, R.Bird
The transformation of functional programs
Functional morphisms a scheme recursion
Introduction to the lambda calculus
Properties lambda theory
Interpreter lambda calculus
Type systems
Logic combinators
Monadic parsing and parsers
Monads

Recommended literature:
Functional programming : practice and theory / Bruce J. MacLennan. Reading : Addison-Wesley, 1989
Haskell the craft of functional programming / Simon Thompson. Harlow : Pearson, 1999
Abstract computing machines : A lambda calculus perspective / W. Kluge. Berlin : Springer, 2005

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 83

A	B	C	D	E	FX
45,78	3,61	19,28	10,84	20,48	0,0

Lecturers: RNDr. Peter Borovanský, PhD.

Last change: 14.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-254/15	Fuzzy Inference and Expert Systems

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Recommended prerequisites:
2-AIN-287 Znalostné systémy

Course requirements:
Tests:
Approximate evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:
Theoretical and practical fundamentals of fuzzy logic, inference and expert systems

Class syllabus:
- Uncertainty and its formalization (triangular (co) standard connection.
- Many valued (fuzzy) logic (Lukasiewicz, Goedel, product).
- Fuzzy Sets.
- Fuzzy numbers and arithmetic.
- Modifiers fuzzy sets (Hedges).
- Fuzzy Reasoning, compositional rule of inference (CRI)
- Fuzzy rules - Mamdani-ho type.
- Fuzzy rules - Takagi-Sugeno-ho type.
- Linguistic variable Zadeh approach.
- Fuzzification.
- Defuzzification.
- Fuzzy inference systems.
- Fuzzy expert systems.

Recommended literature:
Fuzzy množiny a jejich aplikace / Vilém Novák. Praha : Státní nakladatelství technické literatury, 1986
http://ii.fmph.uniba.sk/~guller/Synlogy.pdf

Languages necessary to complete the course:

slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 9

A	B	C	D	E	FX
55,56	11,11	22,22	11,11	0,0	0,0

Lecturers: doc. RNDr. Dušan Guller, PhD.

Last change: 23.09.2017

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-134/14	Geometric modelling in graphics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Projects, oral exam
For the semester, the student can get 50% for exercises, the final exam in the form of a presentation of a chapter from the book has a weight of 50%. The student must solve each task in the exercises at least 30% in order to pass the final exam. Grading: 92-100 A, 84-91 B, 76-83 C, 68-75 D, 60-67 E. Details on the subject page.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
After completing the course, students will be able to distinguish between the current methods and options for creating, modeling and digital representation of three-dimensional objects. He will be able to implement these structures and procedures to use and modify them under the existing modeling tools.

Class syllabus:
1. Polygonal networks - describes the structure for polygonal representation networks, simplification, smoothing compression and networking, computing over networks (earth, normal, curvature), parameterization and triangularizácia, interactive techniques for modeling networks 2. Parametric curves and surfaces - polynomial and spline representation, design and modeling, tessellation, redistribution curves and surfaces 3. implicit FREP a volumetric representation - classification, modeling, set operations, conversion to the polygonal network 4. point clouds - representation of unorganized set of points, nearest neighbor search set of points, proximity graphs, surface reconstruction, multiview geometry 5. Procedural modeling - L-systems, generating terrain procedurally buildings and cities

Recommended literature:
Curves and Surfaces for computer-Aided geometric design : A practical Guide / Gerald E. Farin. San Diego : Academic Press, 1997

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 25

A	B	C	D	E	FX
40,0	16,0	20,0	8,0	12,0	4,0

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-151/00	German Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Class syllabus:
German language is taught at three levels: beginner, intermediate and advanced. Students opt for one of them depending on whether they need to learn the fundamentals or maintain and/or improve their previous knowledge.
This course's focus is to master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 734

A	B	C	D	E	FX
36,1	27,25	19,62	8,99	2,72	5,31

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-152/00	German Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Class syllabus:
German language is taught at two levels: beginner and intermediate. Students opt for one of them depending on whether they wish to obtain the fundamentals of the language or wish to maintain and/or improve previous knowledge of German.
This course's focus is to to master the fundamentals of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency)

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 480

A	B	C	D	E	FX
36,04	20,21	20,83	13,13	3,33	6,46

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-251/00	German Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Master the basics of general language and basic professional terminology of individual fields of study (depending on the advanced level of students)

Class syllabus:
The course is a follow-up to the German language (1,2). The subject provides a course of intermediate or advanced German language.
This course's focus is to deepen the knowledge of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency).

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 165

A	B	C	D	E	FX
41,21	25,45	20,61	6,67	2,42	3,64

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-252/00	German Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Master the basics of general language and basic professional terminology of individual fields of study (depending on the advanced level of students)

Class syllabus:
The course is a follow-up to the German language (1-3). It provides a course of intermediate and advanced German language.
This course's focus is to deepen the knowledge of the common language and basic technical terms of particular fields of study (depending on the student's level of German proficiency).

Recommended literature:
Appropriate study material is supplied by teacher based on the participants'level of German proficiency.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 90

A	B	C	D	E	FX
42,22	24,44	12,22	12,22	3,33	5,56

Lecturers: Mgr. Alexandra Maďarová, Mgr. Simona Tomášková, PhD.

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-129/15	Informatics - Generic Subject

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: The number of credits and the conditions of fulfillment are given by the rules of the foreign university.
Examination: written, oral
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Ability to keep in touch with the latest developments in their discipline within the subjects. After completing the course, students will learn how to study abroad, make new contacts in their field, on which they can build their professional growth, learn about a new cultural environment, learn how to adapt to a foreign team, improve communication skills.

Class syllabus:
Subject in the field of artificial intelligence and informatics. The course is intended only for students who complete part of their studies at foreign universities as part of study stays on the basis of an agreement. The choice of the subject is subject to the consent of the guarantor of the study program. The number of credits and the conditions of fulfillment are determined by the rules of the foreign university.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
25,0	37,5	37,5	0,0	0,0	0,0

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-101/15	Information Systems - Generic Subject

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: The number of credits and the conditions of fulfillment are given by the rules of the foreign university.
Examination: written, oral
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Ability to keep in touch with the latest developments in their discipline within the subjects. After completing the course, students will learn how to study abroad, make new contacts in their field, on which they can build their professional growth, learn about a new cultural environment, learn how to adapt to a foreign team, improve communication skills.

Class syllabus:
Subject in the field of information systems. The course is intended only for students who complete part of their studies at foreign universities as part of study stays on the basis of an agreement. The choice of the subject is subject to the consent of the guarantor of the study program. The number of credits and the conditions of fulfillment are determined by the rules of the foreign university.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
25,0	37,5	12,5	25,0	0,0	0,0

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-117/18	Interactive Programming and Computational Curiosity

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KZVI/2-AIN-117/15

Course requirements:
tests, bonus homeworks,
practical exam, project defence
Scale: A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
The student will acquire programming experience with the new Programming Paradigms - symbolic programming in an interpreted language, which uses object-oriented programming, events, parallel processes and multiple objects, but in the context of school science, educational programming and the development of interactive learning programs - of microworld. The student will learn how to design and develop small teaching the microworld for interactive, visual modeling and Constructivism (learning by discovery and investigation) for primary and secondary school.

Class syllabus:
Korytnačia geometria a korytnačí modul v jazyku Python ako nástroj na modelovanie a skúmanie geometrických vizuálnych štruktúr. Kolónie objektov. Algoritmické problémy súvisiace s takýmto modelovaním. Skúmanie abstraktných výtvarných diel 20. storočia prostriedkami moderného symbolického programovania. Objavujeme farby, farebné modely a farebné prechody objaviteľskými pedagogickými postupmi (s diskusiami o modernej pedagogike a tvorbe softvérových aplikácií na podporu učenia sa žiakov a študentov všetkých stupňov vzdelávania). Vzory, dlaždice, repetície a emergentné vizuálne efekty, a s nimi súvisiace algoritmické problémy. Modelovanie stromov. Modelovanie mobilných abstraktných kompozícií pomocou splajnov, rekurzívnych dátových štruktúr a rekurzívnych algoritmov.

Recommended literature:
vlastné elektronické študijné materiály vyučujúceho
bežná študijná literatúra k programovaniu v jazyku Python
Clayson, J.: Visual Eye. Unpublished manuscript, 2015
Clayson, J.: Visual Modeling with Logo. The MIT Press, 1988

Abelson, H., diSessa, A.: Turtle Geometry. The Computer as a Medium for Exploring Mathematics. The MIT Press, 1986
Blaho, A., Kalas, I.: Learning by Developing. Logotron, UK, 1998

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 92

A	B	C	D	E	FX
25,0	19,57	11,96	15,22	19,57	8,7

Lecturers: prof. RNDr. Ivan Kalaš, PhD., PaedDr. Daniela Bezáková, PhD.

Last change: 24.04.2018

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI+KAI/2-MXX-131/21	International Team-based Research Project

Educational activities:
Type of activities: course / independent work
Number of hours:
per week: 3 **per level/semester:** 39 / 30s
Form of the course: on-site learning

Number of credits: 5

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: active participation in research in an international student team (25%), presentation of work in a workshop (25%), scientific article (50%)
Indicative evaluation scale: A 90 %, B 80 %, C 70 %, D 60 %, E 50 %
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will learn in the team to agree on a common research topic, formulate research questions, determine research methods for the problem, collect and evaluate data, discuss their findings, present research results to the professional public, analyze and evaluate the scientific work of their colleagues, prepare a scientific article suitable for publication

Class syllabus:
- Research methodology
- Design and implementation of a research project in an international group (preferably interdisciplinary)
- Methods and tools for collaboration in virtual space, collaboration in science and practice
- Academic writing, presentation of research results through scientific articles; objectives, content and structure of scientific articles; forms of academic publication, publication forums and evaluation of their quality
- Quality assurance and feedback - peer review
- Communication of results through posters or conference presentations

Recommended literature:
- Teachers' own electronic study materials published on the course website or in the Moodle system
- Gavora, Peter a kol. 2010. Elektronická učebnica pedagogického výskumu. [online]. Bratislava : Univerzita Komenského, 2010. Dostupné na: http://www.e-metodologia.fedu.uniba.sk/ ISBN 978–80–223–2951–4.

- Tharenou, P., Donohue, R. and Cooper, B., 2007. Management research methods. Cambridge University Press.
- Topping, A., 2015: The Quantitative-Qualitative Continium. In: Gerrish, K. and Lathlean, J., The Research Process in Nursing, p. 159-172
- Williamson, K. and Johanson, G. eds., 2017. Research methods: Information, systems, and contexts. Chandos Publishing.

Languages necessary to complete the course:
English

Notes:

Past grade distribution
Total number of evaluated students: 5

A	B	C	D	E	FX
60,0	0,0	0,0	0,0	40,0	0,0

Lecturers: doc. RNDr. Zuzana Kubincová, PhD., doc. RNDr. Martin Homola, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-144/15	Knowledge Representation and Reasoning

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Semester:
- labs activity 10p (min 5p)
- homework 10p (min 5p)
- midterm 10p
- project 30p (min 15p)

Exam:
- oral exam 40p (min 20p)

Scale of assessment (preliminary/final): 60/40

Learning outcomes:
The course is concerned with problem solving by methods of computational logic, relying on modelling and automated inference: ontologies and their role in knowledge representation, modelling of ontologies and knowledge bases, description logics, deduction, induction abduction, explanatory reasoning. Students gain insight into the various methods of inference in terms of semantics and algorithms.

Class syllabus:
- Knowledge representation and reasoning
- Ontologies and knowledge bases
- Description logics as a logical foundation for representation and reasoning with ontologies
- Inference algorithms for description logics (deduction)
- Ontology-based data access
- Induction and abduction
- Finding explanations
- Practical application of knowledge representation and reasoning

Recommended literature:
Van Harmelen, F., Lifschitz, V. and Porter, B. eds., 2008. Handbook of knowledge representation. Elsevier.

Baader, F., Horrocks, I., Lutz, C. and Sattler, U., 2017. Introduction to description logic. Cambridge University Press.
Baader, F., Calvanese, D., McGuinness, D., Patel-Schneider, P. and Nardi, D. eds., 2003. The description logic handbook: Theory, implementation and applications. Cambridge university press.
Staab, S. and Studer, R. eds., 2010. Handbook on ontologies. Springer Science & Business Media.
Research papers.

Languages necessary to complete the course:
English, Slovak

Notes:

Past grade distribution
Total number of evaluated students: 23

A	B	C	D	E	FX
47,83	26,09	8,7	8,7	4,35	4,35

Lecturers: doc. RNDr. Martin Homola, PhD., Mgr. Júlia Pukancová, PhD.

Last change: 23.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-287/15	Knowledgeable Problem Solving Systems

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/2-IKV-234/00

Course requirements:

Learning outcomes:

Class syllabus:

Recommended literature:

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 0

A	B	C	D	E	FX
0,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Dušan Guller, PhD.

Last change: 02.06.2015

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-188/15	Life Cycle of Infornation Systems

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
During semester: submitting of partial work
Final grade depends on the project
Evaluation based on scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will understand later phases of information systems life cycle - service and support, working with legacy code.

Class syllabus:
1. Software development life cycle.
2. Relation to information systems development models
3. Deployment
4. Versioning
5. Software maintenance - planning
6. Software maintenance - processes
7. Software maintenance - categorization
8. Customer support – tools and methods
9. Reverse engineering
10. Integration

Recommended literature:
Software engineering : The production of quality software / Shari Lawrence Pfleeger. New York : Macmillan, 1987

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 0					
A	B	C	D	E	FX
0,0	0,0	0,0	0,0	0,0	0,0
Lecturers: Mgr. Pavel Petrovič, PhD.					
Last change: 18.11.2021					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-INF-150/15	Machine Learning

Educational activities:
Type of activities: lecture
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Recommended prerequisites:
(1-INF-115 Algebra (1) OR 1-AIN-152 Linear Algebra) AND 2-INF-175 Probability and Statistics

Course requirements:
homework assignments (30%), project (30%), final exam (40%)
To pass the exam, a student has to get at least half of the points on the exam.
A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
Students will be familiar with basic machine learning techniques, and they will be able to use these techniques in practical applications.

Class syllabus:
Supervised machine learning (linear and generalized linear regression, neural networks, classification with support vector machines, kernel methods, discrete classifiers). Machine learning theory (statistical model of machine learning, bias-variance trade-off, overfitting and underfitting, PAC learning, VC dimension estimates). Unsupervised machine learning (clustering, self-organizing maps, principal component analysis). Reinforcement learning. Ensemble learning (bagging, boosting).

Recommended literature:
The elements of statistical learning : Data mining, inference, and prediction / Trevor Hastie, Robert Tibshirani, Jerome Friedman. New York : Springer, 2009
Pattern recognition and machine learning / Christopher M. Bishop. New York : Springer, 2006
Machine learning / T. M. Mitchell. New York : McGraw Hill, 1997
Biological sequence analysis : Probabilistic models of proteins and nucleic acids / Richard Durbin ... [et al.]. Cambridge : Cambridge University Press, 1998

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 198

A	B	C	D	E	FX
42,42	16,16	12,63	8,08	7,07	13,64

Lecturers: Mgr. Vladimír Boža, PhD., Mgr. Marek Šuppa, doc. Mgr. Tomáš Vinař, PhD.

Last change: 24.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-119/15	Mathematics - Generic Subject

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: The number of credits and the conditions of fulfillment are given by the rules of the foreign university.
Examination: written, oral
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Course in the field of advanced mathematics, numerical and optimization methods. Ability to keep in touch with the latest developments in their discipline within the subjects. After completing the course, students will learn how to study abroad, make new contacts in their field, on which they can build their professional growth, learn about a new cultural environment, learn how to adapt to a foreign team, improve communication skills.

Class syllabus:
The course is intended only for students who complete part of their studies at foreign universities as part of study stays on the basis of an agreement. The choice of the subject is subject to the consent of the guarantor of the study program. The number of credits and the conditions of fulfillment are determined by the rules of the foreign university.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 3

A	B	C	D	E	FX
0,0	0,0	100,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KI/1-BIN-301/15	Methods in Bioinformatics

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Homework assignments (30%), group project (10%), weekly quizzes (10%), written exam (50%). Grades: A 90%, B 80%, C 70%, D 60%, E 50%. More information on the course website.
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
Students will be familiar with basic problems and methods in bioinformatics; they will be able to choose an appropriate method for a given biological problem and to interpret its results.

Class syllabus:
Basic concepts from molecular biology, algorithms and machine learning. Sequencing and assembling genomes. Gene finding. Sequence alignment. Evolutionary models and phylogenetic trees. Comparative and population genomics. RNA structure. Motif finding and gene expression analysis. Protein structure and function. Selected current topics.
Students of computer science programs will focus on computer science methods and mathematical modeling of the covered problems.

Recommended literature:
Biological sequence analysis : Probabilistic models of proteins and nucleic acids / Richard Durbin ... [et al.]. Cambridge : Cambridge University Press, 1998
Understanding bioinformatics / Marketa Zvelebil, Jeremy O. Baum. New York : Garland Science, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 149

A	B	C	D	E	FX
32,89	18,79	20,13	14,77	5,37	8,05

Lecturers: doc. Mgr. Bronislava Brejová, PhD., doc. Mgr. Tomáš Vinař, PhD., Mgr. Askar Gafurov, PhD.
Last change: 21.06.2022
Approved by:

STATE EXAM DESCRIPTION

Academic year: 2021/2022	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAI/2-AIN-953/15	**Course title:** Methods of Applied Informatics
Number of credits: 4	
Educational level: II.	
State exam syllabus:	
Last change: 29.05.2020	
Approved by:	

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-246/15	Multiagent Systems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary assessment: work on exercises, homeworks
Final assessment: exam (test)
Scale: A 76%, B 70%, C 64%, D 58%, E 52%
Scale of assessment (preliminary/final): 50/50

Learning outcomes:
We provide knowledge from domain of multi-agent system. The primary focus is put on development of system which produces extremely complex behavior (robots, models of living creatures).

Class syllabus:
Agent (a specific definition). Autonomy and mobility. Receptors, efectors, controller, senzors, aktuators. Agent classification: reactive, deliberative and hybrid agents. Communication among agents: direct and indirect. Representation languages: XML and KIF. Multi-agent system (a specific definition). Communication languages. KQML.
Implementation of multi-agent systems. Multi-agent system implemented as a middleware.Implementation within OOP virtual machine. Implementation over SRR model (IPC). Pyramidal Client – Server architecture. Agent – Space architecture. Robustness, decentralization, normalization.
Deliberative and non-deliberative robotics. New artificial intelligence. Dekomposition by function and activity. Subsumption architecture. PKA model.

Recommended literature:
Cambrian intelligence : The early history of the new / Rodney A. Brooks. Cambridge, Mass. : MIT Press, 1999
Jozef Kelemen: Strojovia a agenty, Archa, Bratislava, 1993Nils J. Nilson: Artificial Intelligence, A new synthesis, Morgan Kaufman Publishers Inc., San Francisco, Ca, 1997
R. Brooks: Cambrian Intelligence, MIT Press, Cambridge, Mass, 1999

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 38

A	B	C	D	E	FX
50,0	21,05	13,16	10,53	2,63	2,63

Lecturers: RNDr. Andrej Lúčny, PhD.

Last change: 16.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KMANM/2-AIN-114/14	Multidimensional analysis and numerical mathematics

Educational activities:
Type of activities: course
Number of hours:
per week: 4 **per level/semester:** 52
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KMANM/2-MPG-243/15

Course requirements:
Regular assessment (100% =90 points): 3 tests 15 points each, 9 individual tasks 5 points each
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students should know the methods and tools for numerical computations required in a computer graphics (physical modeling and animation, global illumination problem, specific modeling), after completing the course.

Class syllabus:
The computational model in numerical mathematics. Numerical stability and robustness, error analysis. Approximation theory. Numerical algebra. Solving large systems of linear equations. Finding roots of nonlinear equations. Numerical differentiation and integration. Optimization - formulation challenges the foundations of convex analysis, numerical methods used to find minima - Gradient methods. Finite Difference Method and Finite Element Method. Introduction to numerical solution of equations diferencálnych. Libraries of numerical methods and work with them.

Recommended literature:
Numerická matematika pre informatika : Riešené príklady v programe Mathematica / Roman Ďurikovič, Vladimír Ďurikovič. Trnava : Univerzita sv. Cyrila a Metoda, 2011
Numerické metódy / Jela Babušíková, Marián Slodička, Juraj Weisz. Bratislava : Univerzita Komenského, 2000

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution Total number of evaluated students: 212					
A	B	C	D	E	FX
22,17	8,02	15,09	20,28	28,77	5,66
Lecturers: Mgr. Jela Babušíková, PhD.					
Last change: 21.06.2022					
Approved by:					

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-132/15	Neural Networks

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/1-AIN-480/00

Course requirements:
individual projects during the semester.
Final written-oral exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
After completing the course will student understands the basic principles of connectionism (neural networks) know the basic models of neural networks and know their usefulness when solving various tasks (eg. Pattern recognition, classification, time series prediction, memorizing patterns and others). Lectures are combined with computer simulations exercises in Python.

Class syllabus:
Introduction, inspiration from biology, brief history, NS with logical neurons.
Binary / continuous perceptron: the concept of learning with the teacher, classification of patterns.
Single-layer NS: linear self-association, classification, error functions.
Multilayer perceptron: error backpropagation method, training and test set, generalization, model selection, validation.
Modifications of gradient methods, second order optimization, regularization. Optimization problems.
Unsupervised learning, feature extraction, principal component analysis, self-organizing map, data visualization.
Sequence data modeling: forward NS, relation to n-grams, partially and completely recurrent models, SRN model, BPTT algorithms, RTRL.
Expansion of hidden representation: NS with radial basis functions (RBF), echo state network (ESN).
Deep learning, convolutional neural networks: introduction.
Modern recurrent NS: autoencoders, GRU, LSTM.
Hopfield model: deterministic dynamics, attractors, autoassociative memory.

Stochastic recurrent NS models: basics of probability theory and statistical mechanics, Boltzmann machine, RBM model, Deep Belief Network.
The recent trends in NS.

Recommended literature:

Neural networks and learning machines / Simon Haykin. Upper Saddle River : Pearson education, 2009
Úvod do teórie neurónových sietí / Vladimír Kvasnička ... [et al.]. Bratislava : Iris, 1997
Neural networks (slajdy k prednáškam), Igor Farkaš, Knižničné a edičné centrum FMFI UK v Bratislave, 2011.
Goodfellow I., Bengio Y., Courville A. (2016). Deep Learning. MIT Press.
Zhang A. et al. (2020). Dive into Deep Learning. An interactive deep learning book with code, math, and discussions, based on the NumPy interface.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 151

A	B	C	D	E	FX
29,8	15,89	14,57	10,6	11,26	17,88

Lecturers: prof. Ing. Igor Farkaš, Dr.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-286/15	Ontologies and Knowledge Engineering

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KAI/1-AIN-646/00

Course requirements:
Semester: project (60pts), ongoing work assessment (20pts)
Exam: written exam (20pts)
Min. passing requirements: 50% from the semester and 50% from the exam
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 80/20

Learning outcomes:
Students become acquainted with ontologies, with their role in data representation and sharing, with ontological representation and query languages, and with ontology engineering methodologies. They will also get acquainted with Semantic Web standards and with the principles and possibilities of publishing data in the Linked Open Data network, as well as the use of such data in knowledge-based applications.

Class syllabus:
- Ontologies and their applications
- Well-known ontologies
- Ontological representation languages (RDF, RDF Schema, OWL)
- Ontologies and databases
- SPARQL query language
- Linked Open Data network
- Ontology engineering
- Applications of ontologies in informatics

Recommended literature:
Staab, S. and Studer, R. eds., 2010. Handbook on ontologies. Springer Science & Business Media.
Allemang, D. and Hendler, J., 2011. Semantic web for the working ontologist: effective modeling in RDFS and OWL. Elsevier.
Selected relevant recent scientific papers.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: doc. RNDr. Martin Homola, PhD., Mgr. Júlia Pukancová, PhD.

Last change: 30.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-264/19	OpenCV

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation: presentation, project
Evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 0/100

Learning outcomes:

Class syllabus:
1. Image representation and processing, color models and transformations among them
2. Morphologic operations with image, contours detection and structural analysis
3. Filters and kernels. Edge operators.
4. Blending, seemless cloning, morphing, inpainting
5. Image segmentation. MeanShift filter. GrabCut. Intrinsic image.
6. Image alignment and registration. Phase correlation. ECC. Image features: SIFT, SURF, BRIEF, ORB
7. Camera and video. Optical flow. Stereovision. Camera calibration.
8. Machine learning: PCA, LDA, eigenimages, SVM, cascade regressor and gradient boosting
9. Object detectors. Hough transform. Haar detector. HOG detector. LBPH.
10. Object trackers. Kalman filter. CamShift. MIL tracker. Motion detector.
11. Usage of deep learning models: Colorization, YOLO detectors, vectorization and recognition, EAST text detector, Tesseract OCR, GOTURN.
The used programming languages: Python a C++

Recommended literature:
Learning OpenCV 3, Computer Vision in C++ with the OpenCV Library By Gary Bradski, Adrian Kaehler, O'Reilly Media, 2016
learnopencv.com

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 94

A	B	C	D	E	FX
52,13	6,38	11,7	4,26	1,06	24,47

Lecturers: RNDr. Andrej Lúčny, PhD.

Last change: 16.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-204/10	Pattern Recognition

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
tests, projects, oral exam
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Graduates will acquire basic methods of classification.

Class syllabus:
The role of classification, feature articles and Syntax Notation.
Selection and pretreatment symptoms.
Classifiers, basic concepts.
Bayesian decision theory, discriminatory and divisive functions hypersurface, the criterion of the minimum error.
Decision trees.
Discriminant analysis, linear classifier.
Mechanisms of support vectors (SVM).
Neural networks.
Uncontrolled classifiers.
Hidden Markov models.
Quality rating classification.
Syntactic recognition, inference grammar. Special types of grammar.

Recommended literature:
Pattern classification / Richard O. Duda, Peter E. Hart, David G. Stork. New York : Wiley Interscience, 2001
Classification pattern recognition and reduction of dimensionality / edited by P. R. Krishnaiah, L. N. Kanal. Amsterdam : North-Holland, 1982
Modern multivariate statistical techniques : Regression, classification, and manifold learning / Alan Julian Izenman. New York : Springer, 2008

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 182

A	B	C	D	E	FX
14,29	16,48	25,82	20,88	12,64	9,89

Lecturers: Ing. Viktor Kocur, PhD.

Last change: 21.09.2018

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-263/00	Photorealism

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: homework
Indicative assessment scale: A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Students will learn methods of solving a global rendering problem. During this course, they will study the latest methods of calculating the rendering equation from a mathematical and programming point of view.

Class syllabus:
Rendering equation and radiosity equation, final elements, radiosity, Monte Carlo sampling, density estimation, photon mapping, global rendering of dynamic scenes, BRDF measurement and light source measurement, global rendering in real time, IBR, tone mapping, perception effects.

Recommended literature:
Wei D., Durikovic R., Vilbrandt C., et. al., "IT Text series: Computer Graphics", 2003
Michael Cohen, John Wallace, Radiosity and Realistic Image Synthesis, Academic Press, 1993.
Andrew Glassner, Principles of Digital Image Synthesis, 2 Bände, Morgan Kaufman, 1996.
Jensen, Realistic Image Synthesis Using Photon Mapping

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 28

A	B	C	D	E	FX
57,14	7,14	25,0	3,57	0,0	7,14

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-110/00	Physical Education and Sport (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Practicing of the students´ game skills in collective sports: basketball, volleyball, football, floorball and hockey. Mastering of the basic technique of a particular sport discipline in other sports. In paddling, basic training on still and slightly flowing water. Development of coordination skills, improvement of articular mobility and cardiovascular system.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1657

A	B	C	D	E	FX
98,37	0,6	0,06	0,0	0,0	0,97

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-120/00	Physical Education and Sport (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Practicing of offensive and defensive game combinations and playing with modified rules in collective sports such as basketball, volleyball, football, floorball, hockey. Command of elements of higher difficulty in locomotion skills (swimming - crawl stroke, breast stroke, butterfly stroke, trampoline jumping and aerobics – practicing of areobics compositions, bodybuilding – development of the main muscle groups, paddling on running water. Testing of the level of physical fitness and coordination skills.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1557

A	B	C	D	E	FX
98,52	0,39	0,06	0,06	0,06	0,9

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Branislav Nedbálek, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-210/00	Physical Education and Sport (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
To improve offensive and defensive game combinations in collective sports. Practicing of tactical and technical elements in individual sports. Compensatory exercises to correct wrong body posture. Stretching. Competition rules in sport disciplines.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1281

A	B	C	D	E	FX
98,75	0,47	0,08	0,0	0,0	0,7

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Júlia Raábová, PhD., Mgr. Branislav Nedbálek, Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-220/00	Physical Education and Sport (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:

Class syllabus:
Sport training for Faculty Championships in a selected sport with modified rules. Selection of sport-talented students into teams of the Faculty Sport League, University League of Bratislava Faculties, and participation in sport events of the Faculty and University.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1110

A	B	C	D	E	FX
98,47	0,45	0,09	0,09	0,09	0,81

Lecturers: PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, Mgr. Jana Leginusová, Mgr. Tomáš Kuchár, PhD., PaedDr. Mikuláš Ortutay, Mgr. Martin Dovičák, PhD., Mgr. Branislav Nedbálek, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký

Last change: 15.03.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-206/15	Physical-based Animations and Mathematical Modeling

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation: assignments, homeworks,
Exam: final exam, oral exam
Evaluation scale: A 92%, B 84%, C 76%, D 68%, E 60%
For the semester, the student can get 10% for exercises, 60% for homework, final written exam with a weight of 30% oral final exam is voluntary with a weight of 20%. The student must solve at least 30% of each homework in order to pass the final written exam. Grading: 92-100 A, 84-91 B, 76-83 C, 68-75 D, 60-67 E. Details on the course page.
Scale of assessment (preliminary/final): 40/60

Learning outcomes:
Students will learn the basic techniques of simulation particle systems, solving systems of ordinary differential equations numerically, the object collision detection. Understand the principles of dynamics of rigid bodies and the principle of the creation of computer animation and camera movement. Understand how to construct physics engine for games or video animation.

Class syllabus:
Particle systems, motion equations of first order integration methods to calculate the speed and position, state vector system, external forces, restrictive conditions - constraints, response forces, particle collisions - plane.
Numerical solution of differential equations, Euler method, Runge-Kuta method, stability criteria to select the time step.
Lagrange method without networks, modeling and animation point cloud, SPH, deformation
Animation mobility, spline interpolation to animate movement, reparametrisation spline curves by length, and orientation quaternion interpolation of two or more quaternion.
Collision detection, Z buffer algorithm, necessary and sufficient conditions when there are two bodies in a collision, parting line, hierarchy envelopes force response (Response Forces). Three phase detection wide, medium and narrow.
Dynamics of rigid bodies, equations of motion, velocity, acceleration, angular velocity and angular acceleration, inertia matrix.
Procedurárne animation, systems and methods for creating computer animation liquids, fire, smoke.

Computer animation in games and in the film industry. Other applications of computer animation with further developments in the field of computer animation using physical effects.

Recommended literature:

Visual Quantum mechanics : Selected Topics with Computer/Generated animations of Quantum-Mechanical phenomena / Bernd Thaller. New York : Springer, 2000

Computer facial animation / Frederic I. Parke, Keith Waters. Wellesley : A. K. Peters , 1996

SIGGRAPH tutorialy dostupné na http://dl.acm.org/dl.cfm?CFID=412417535&CFTOKEN=50913605

Dostupné texty k prednáške. https://dai.fmph.uniba.sk/w/Physical-based_Animations_and_Mathematical_Modeling_Material

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution

Total number of evaluated students: 341

A	B	C	D	E	FX
34,6	18,18	12,61	14,08	7,92	12,61

Lecturers: prof. RNDr. Roman Ďurikovič, PhD., Mgr. Andrej Mihálik, PhD.

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-290/15	Practice

Educational activities:
Type of activities: practice
Number of hours:
per week: **per level/semester:** 150s
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: Attendance, activity report
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The student will find a suitable company or scientific institution that works in the field of information technology, acquire basic work habits and gain experience in the field of informatics, which is necessary for easier job search. Completing a course with a good recommendation will allow the student to work after graduation.

Class syllabus:
924 / 5000
Translation results
The student will find a suitable company or scientific institution that works in the field of information technology and submit his proposal for approval to the guarantor. The student completes the course according to the instructions of the institution.
The aim of the course is for students to get acquainted with new IT technologies, devices, learn to work with them, operate and operate them.
As a condition for obtaining the evaluation, the student prepares and submits a written report confirmed by the responsible leader in the institution consisting of:
1. Confirmations of attendance of at least 150 hours lasting 9 weeks, i. attendance sheets
2. Activity report or statement sheets with a precise description of the activities
The evaluation for the internship, the minimum duration of which is 9 weeks (150 hours), is recorded by the guarantor after its completion. The internship can be completed at any time during the 1st and 2nd year of the master's study, but no later than the deadline set by the end of the examination period of the given semester.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 156

A	B	C	D	E	FX
53,85	7,69	28,85	4,49	0,64	4,49

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-118/14	Programming in operating systems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
A homeworks, project
written exam
Scale: 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
After completing the course, students will be able to create a low-level system programs and services that communicate directly with the operating system or hardware. Get an overview of the interfaces between the operating system and the user and the access code and techniques for creating system programs.

Class syllabus:
System call, communication with the hardware, work with file systems, networks; run programs, dynamic link libraries, processes and threads, synchronization mechanisms; system services (services), security (authentication, authorization, protection against failures and attacks) vs userspace kernelspace, driver (driver module)

Recommended literature:
Modern operating systems / Andrew S. Tanenbaum. Upper Saddle River : Prentice Hall International, 2001

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 123

A	B	C	D	E	FX
23,58	20,33	22,76	17,07	4,07	12,2

Lecturers: RNDr. Jozef Šiška, PhD.

Last change: 18.11.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-109/15	Programming of Parallel and Distributed Systems

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 3 / 1 **per level/semester:** 39 / 13
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
excercises, exam
A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 80/20

Learning outcomes:
Graduates of the course will be acquainted with the issues of parallel and distributed programming. They will get acquainted with the basic algorithms used in practice, as well as with methods how to prove the correctness or effectiveness of algorithms. They will gain an overview of basic parallel and distributed architectures, a brief overview of various paradigms and programming languages.

Class syllabus:
At the beginning, students will be introduced to a simple way to write algorithms for parallel and distributed computing, so that these notations are applicable to different types of architectures. They will also gain the basics of logic that will be used to express and prove the properties of programs. Then they will get acquainted with the basic architectures of parallel and distributed systems. The core of the course consists of selected basic algorithms of parallel and distributed systems (eg Shortest path, Reader-problémWriters problem, Evening philosophers, Meeting coordination, Drinking philosophers, Sorting, Faulty channels, Global snapshots, Stable feature detection, Byzantine agreement). Alternatively, their zones may expand in line with developments in the field. At the end of the course there will be an overview of different programming languages and paradigms and logics.

Recommended literature:
Parallel program design : A Foundation / K. Mani Chandy , Jayadev Misra. Reading : Addison-Wesley, 1988 An introduction to parallel algorithms / Joseph Jájá. Boston : Addison-Wesley, 1992 C. Stirling: Modal and Temporal Properties of Processes, Springer 2001 Elektronické poznámky k prednáške, http://ii.fmph.uniba.sk/~gruska/udpp/Beziacaudppprednaska2014.pdf

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 264

A	B	C	D	E	FX
25,38	18,18	21,97	23,11	6,44	4,92

Lecturers: doc. RNDr. Damas Gruska, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-923/15	Project Seminar (1)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Evaluation of the diploma thesis progress
1. Presentation, 2. First prototype implemented, 3. Research papers studied and the detail knowledge of the the problem is required. 4. Framework for development of the thesis should be already set.
A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Learning to quickly extract the basic idea of scientific articles.

Class syllabus:
The first phase of the project master thesis. Conventions for writing professional texts informatics. Work on the project and implementation so that results in the diploma thesis.

Recommended literature:
LATEX : Podrobný průvodce / Helmut Kopka, Patrick W. Daly ; překlad Jan Gregor. Brno : Computer Press, 2004
LATEX : A Document preparation system / Leslie Lamport. Reading : Addison-Wesley, 1986

Languages necessary to complete the course:
slovak, english

Notes:

Past grade distribution
Total number of evaluated students: 271

A	B	C	D	E	FX
57,93	14,39	11,07	3,69	4,06	8,86

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 23.09.2017

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-924/15	Project Seminar (2)

Educational activities:
Type of activities: seminar
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites: FMFI.KAI/2-AIN-923/15 - Project Seminar (1)

Recommended prerequisites:
2-AIN-924 Projektový seminár (1)

Course requirements:
Evaluation of the diploma thesis progress
1. Presentation, 2. First prototype implemented, 3. Research papers studied and the detail knowledge of the the problem is required. 4. Framework for development of the thesis should be already set. 5. Ano chapter of the thesis should be in its final stage.
All requirements must be satisfactory completed.
A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Theoretical background of the thesis will be known and the implementation flips to its final stage of evaluation.

Class syllabus:

Recommended literature:
LATEX : Podrobný průvodce / Helmut Kopka, Patrick W. Daly ; překlad Jan Gregor. Brno : Computer Press, 2004
LATEX : A Document preparation system / Leslie Lamport. Reading : Addison-Wesley, 1986

Languages necessary to complete the course:
slovensky, anglicky

Notes:

Past grade distribution
Total number of evaluated students: 272

A	B	C	D	E	FX
53,31	15,07	12,13	4,78	6,99	7,72

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.
Last change: 23.09.2017
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-145/10	Qualitative Modelling and Simulation

Educational activities:
Type of activities: course
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KI/2-AIN-143/00

Course requirements:
Continuous assessment: class activity
Examination: written examination
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 10/90

Learning outcomes:
The graduate of this course is able to think in terms of qualitative generic structures, can use tools of uncertainty representation and qualitative simulation. He can model and qualitatively estimate the behavior of systems around us.

Class syllabus:
Representation of incomplete knowledge of the system, abstraction from details while maintaining qualitatively significant features and prediction of behavior. Sign arithmetic. Physical system, structure, behavior, function, model, modeling versus simulation. QSIM simulation algorithm and its properties. Examples of qualitative models - springs, vessels, regulators, ecology and social phenomena. Generic model classes, cross-domain analogies. Comparative statics. Stability of dynamic systems, phase portraits, equilibria. Systems thinking, sign digraphs, positive and negative feedbacks and their importance in behavioral regulation. Automatic modeling.

Recommended literature:
Modelování a simulace komplexních systémů : Jak lépe porozumět světu / Radek Pelánek. Brno : Masarykova univerzita, 2011
Kvalitatívne modelovanie a simulácia / Martin Takáč. Bratislava : Univerzita Komenského, 2003

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 64

A	B	C	D	E	FX
37,5	18,75	15,63	10,94	17,19	0,0

Lecturers: doc. RNDr. Martin Takáč, PhD.

Last change: 16.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-128/15	Real-time Graphics and GPU Computations

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 2.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAG/2-MPG-101/00 and FMFI.KAG/2-MPG-102/00

Course requirements:
The student can get 70% of the evaluation for the project. The student must elaborate the project of at least 50% in order to pass the final oral exam. Grading: 92-100 A, 84-91 B, 76-83 C, 68-75 D, 60-67 E. More detailed informations on the course page.
Scale of assessment (preliminary/final): 70/30

Learning outcomes:
The course represents the key themes, principles and techniques used in the rendering of virtual scenes in real time. This procedure is most commonly used in making 3D games, but also in various scientific vizualizations, such as visualization of medical data. After the course the students will be able to analyze and implement current procedures, algorithms, programming effects for graphics cards and the create the visualization applications. The subjects students will be able to develop gaming applications on different platforms, applications in virtual and mixed reality and create visualizations of medical data.

Class syllabus:
1. Graphic display channel - description of the graphics hardware architectures, programming of graphics cards, coordinate systems, programmable parts of the display channel, description and formats of virtual scene during the rendering, OpenGL API
2. Animation - a description of the object pose representation (position, rotation, scale), nuts and Quaternions, linear and cubic interpolation for animation
3. Light - description of lighting models and their implementation using shaders, textures in lighting model, direct and defferred lighting, use rendering to texture and shadows, approximation of global illumination methods
4. Post-process Effects - description of algorithms to improve the quality of the final output image, motion blur, depth of field, SSAO, reflections and refractions, HDRI, bloom, toon shading
5. Image-based rendering - use of texture to speed up calculations of lighting, textures for backgrounds to represent complex objects (bilboarding), image processing algorithms on the GPU, volumetric graphics

6. Accelerating algorithms - algorithms and structures to accelerate rendering complex scenes, trimming techniques, level of detail, collision detection
7. GPGPU - description of the graphics card performance for general computing, CUDA and OpenCL language, image and video processing, physical simulation of phenomena on the GPU, ray tracing on the GPU

Recommended literature:
Real-time rendering / Tomas Akenine-Möller, Eric Haines, Naty Hoffman. Wellesley : A. K. Peters, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 42

A	B	C	D	E	FX
30,95	30,95	9,52	7,14	9,52	11,9

Lecturers: Mgr. Andrej Mihálik, PhD.

Last change: 22.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-161/00	Russian Language (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
To master the fundamentals of general Russian. The language level is A1.
Learning the Cyrillic (Russian) alphabet, gaining basic language competence, building up skills and confidence in dealing with unfamiliar authentic and semi-authentic texts.
The subject provides a course in Russian language for beginners.

Recommended literature:
The textbook: : Точка Ру A1 (Ольга Долматова, Екатерина Новачац), pracovné karty Падежи 1 (Л.С. Безкоровайная, В.Е. Штыленко).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 707

A	B	C	D	E	FX
58,56	16,55	11,03	4,38	1,84	7,64

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-162/00	Russian Language (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
To master the fundamentals of general Russian.
Learning the Cyrillic (Russian) alphabet, gaining basic language competence, building up skills and confidence in dealing with unfamiliar authentic and semi-authentic texts.
The subject continues the program of Russian language (1) and provides a course of Russian for beginners.

Recommended literature:
Textbook: Точка Ру A1 (Ольга Долматова, Екатерина Новачац), pracovné karty Падежи 1 (Л.С. Безкоровайная, В.Е. Штыленко).

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 421

A	B	C	D	E	FX
65,08	15,68	8,79	3,8	0,95	5,7

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-261/00	Russian Language (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Basic communication in Russian, developing other Russian language skills - listening comprehension, reading and writing.

Class syllabus:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.
The course "Russian for Intermediate Students" is a follow-up to "Russian for Beginners". The subject of the course is general Russian in the range appropriate to the given level.

Recommended literature:
Точка Ру A2 (Ольга Долматова, Екатерина Новачац) a Short Stories in Russian (Olly Richards, Alex Rowlings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 200

A	B	C	D	E	FX
70,5	17,5	8,5	2,5	0,0	1,0

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-262/00	Russian Language (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.

Class syllabus:
Learning the handwritten Russian (Russian Cursive Cyrillic), developing further language skills, gaining knowledge of Russian culture, history and way of life, pre-intermediate to intermediate grammar and vocabulary.
The course "Russian for Intermediate Students" is a follow-up to "Russian for Beginners". The subject of the course is general Russian in the range appropriate to the given level.

Recommended literature:
Точка Ру A2 (Ольга Долматова, Екатерина Новачац) a Short Stories in Russian (Olly Richards, Alex Rowlings)

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 144

A	B	C	D	E	FX
75,69	13,19	6,94	2,78	0,69	0,69

Lecturers: Viktoria Mirsalova

Last change: 20.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-171/20	Slovak Language for Foreign Students (1)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to learn the fundamentals of the Slovak language with the focus on basic communication as well as all other language skills- listening comprehension,reading and writing.

Class syllabus:
The sylabus is targeted at the comprehension of the basics of the Slovak language for the absolute beginners (A1).

Recommended literature:
Krížom- Krážom Slovenčina 1, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 23

A	B	C	D	E	FX
47,83	0,0	0,0	0,0	0,0	52,17

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-172/20	Slovak Language for Foreign Students (2)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to learn the fundamentals of the Slovak language with the focus on basic communication as well as all other language skills- listening comprehension,reading and writing.

Class syllabus:
The sylabus is targeted at the comprehension of the basics of the Slovak language for the absolute beginners (A1) and this course is a follow up course to the Slovak language course 1.

Recommended literature:
Krížom- Krážom Slovenčina 1, additional material to further support the covered topics

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 22

A	B	C	D	E	FX
81,82	0,0	4,55	0,0	0,0	13,64

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-271/20	Slovak Language for Foreign Students (3)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 3.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to better comprehend all the language skills important to enable correct usage of the Slovak language – listening comprehension, reading, writing and speaking.

Class syllabus:
The sylabus is targeted at the comprehension of all the language skills of the Slovak language , and it is a follow up course to the Slovak language course 2.

Recommended literature:
Krížom-Krážom Slovenčina 2, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KJP/1-MXX-272/20	Slovak Language for Foreign Students (4)

Educational activities:
Type of activities: practicals
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 4.

Educational level: I., II.

Prerequisites:

Course requirements:
tests
Course prerequisites:
https://fmph.uniba.sk/microsites/kjp/katedra-jazykovej-pripravy/poziadavky-na-udelenie-priebezneho-hodnotenia-aj1aj2aj3-ostatne-kurzy/
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
This course is aimed for foreign students to better comprehend all the language skills important to enable correct usage of the Slovak language – listening comprehension, reading, writing and speaking.

Class syllabus:
The sylabus is targeted at the comprehension of all the language skills of the Slovak language , and it is a follow up course to the Slovak language course 3.

Recommended literature:
Krížom-Krážom Slovenčina 2, additional material to further support the covered topics.

Languages necessary to complete the course:

Notes:

Past grade distribution
Total number of evaluated students: 7

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Aneta Barnes

Last change: 21.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-115/15	Software for Education

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: work at excercises, review software, written test, two projects
Approximate evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 75/25

Learning outcomes:
Students are able to assess the suitability of a particular educational software for teaching informatics at the elementary and secondary schools, respectively at university. They are able to classify educational software. They can give examples of software that is suitable for training for a specific age group of students. They can review educational software and are able to apply the basics of software engineering of educational software. In a team they write a specification for educational software project and they implement a working prototype of it.

Class syllabus:
The importance of digital technologies in the cognitive process, in teaching and learning.
Definition and classification of pedagogical software, criteria of its evaluation.
Educational applications for teaching computer science to primary and secondary school students.
Information systems used for education.
Software for education and developmental stages of knowledge.
GUI design and use of HCI in educational software programming.
Multimedia and their place in the cognitive process. Action research - students and teachers as co-authors of software design for education.
Principles of creating software for education.
Educational software for students with special needs.

Recommended literature:
Transformations of the school in the digital age / Ivan Kalaš and team. Bratislava: Slovenské pedagogické nakladateľstvo - Mladé letá, 2013
T. Plomp, N. Nieveen et al. Educational Design Research. Slo 2013
own electronic texts published on the website, resp. in the Moodle environment

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 124

A	B	C	D	E	FX
28,23	23,39	25,0	11,29	4,84	7,26

Lecturers: doc. PaedDr. Monika Tomcsányiová, PhD., Mgr. Lucia Budinská, PhD.

Last change: 16.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-288/15	Speech Recognition

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 4.

Educational level: II.

Prerequisites:

Antirequisites: FMFI.KAI/2-IKV-265/00

Course requirements:
Continuous assessment: problem solving, project
Exam: practical, written, oral
Indicative assessment scale: A 92%, B 84%, C 76%, D 68%, E 60%
Scale of assessment (preliminary/final): 60/40

Learning outcomes:
Students will gain theoretical and practical knowledge in the field of speech signal processing. Whether at the level of generation or classification (recognition). In the field of recognition, they will gain experience with techniques based on continuous HMM and DTW. During the exercises, students will gain the appropriate skills to work in the Octave environment (freely distributable compatible alternative to Matlab).

Class syllabus:
Psycho-physical aspects of sound
Quick overview: discrete signal, Fourier transform, PSD, z-transform, FIR and IIR
Head related transfer function (HRTF)
Speech production model, speech synthesis and singing
Determining the vocal pitch
Vector quantization
Gaussian mixture model (GMM)
Speech signal processing, feature vector, HTK/Kaldi toolkit
Recognition of isolated words and continuous speech
Dynamic time warping (DTW)
Continuous hidden Markov models (HMM)
HMM and isolated word recognition
HMM and continuous speech recognition, forced alignment

Recommended literature:
Komunikace s počítačem mluvenou řečí / Josef Psutka. Praha : Academia, 1995

Springer handbook of speech processing / Jacob Benesty, M. Mohan Sondhi, Yiteng Huang (Eds.). Berlin : Springer, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 6

A	B	C	D	E	FX
83,33	0,0	0,0	16,67	0,0	0,0

Lecturers: RNDr. Marek Nagy, PhD.

Last change: 16.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-115/17	Sports in Natur (1)

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Grades: A 90%, B 80%, C 70%, D 60%, E 50%
The condition for the award of 1 or 2 credits is the completion of a multi-day course in its full scope, or the completion of one-day courses in the scope of 4 days. Candidates can apply to the leaders of individual courses. From the presented offer of courses, you can choose the one that suits your interests, abilities and deadlines.

Learning outcomes:
Acquisition and development of basic motor skills and abilities in selected sports: skiing and snowboarding. Mastering the correct technique of performing individual movements, which are necessary for skiing and snowboarding.

Class syllabus:
The student can sign up for the outdoor sports courses offered by the department: skiing, snowboarding. The lessons in the courses are focused on the development of basic and special movement skills and mastering the techniques needed for the sports.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ does not rent ski equipment.

Past grade distribution
Total number of evaluated students: 83

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD.

Last change: 16.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KTV/2-MXX-116/18	Sports in Natur (2)

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 2

Recommended semester: 2.

Educational level: II.

Prerequisites:

Course requirements:
Grades: A 90%, B 80%, C 70%, D 60%, E 50%.
The condition for the award of 1 or 2 credits is the completion of a multi-day course in its full scope, or the completion of one-day courses in the scope of 4 days. Candidates can apply to the leaders of individual courses. From the presented offer of courses, you can choose the one that suits your interests, abilities and deadlines.

Learning outcomes:
Creating a positive and lasting relationship with physical activity. Acquisition and mastery of basic motor skills and abilities in outdoor sports: windsurfing, beach volleyball, water tourism - river rafting, hiking and other sports according to interest. Training and improving the technique needed for the sports.

Class syllabus:
The student can sign up for the outdoor sports courses offered by the department: water tourism - river rafting, windsurfing, beach volleyball, hiking and other hobby sports. The lessons in the courses are focused on the development of basic and special movement skills and, mastering the techniques needed for the sports.

Recommended literature:

Languages necessary to complete the course:
Slovak

Notes:
KTVŠ will provide sports equipment.

Past grade distribution
Total number of evaluated students: 50

A	B	C	D	E	FX
94,0	0,0	0,0	0,0	0,0	6,0

Lecturers: Mgr. Martin Dovičák, PhD., Mgr. Tomáš Kuchár, PhD., Mgr. Jana Leginusová, PaedDr. Dana Mašlejová, Mgr. Ladislav Mókus, PaedDr. Mikuláš Ortutay, Mgr. Júlia Raábová, PhD., Mgr. Tomáš Lovecký
Last change: 16.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-285/17	Symbolic Programming and LISP

Educational activities:
Type of activities: course
Number of hours:
per week: 3 **per level/semester:** 39
Form of the course: on-site learning

Number of credits: 4

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Preliminary assessment: homeworks, test, projects.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
To acquaint students not only with the programming language LISP, but also with programming paradigms like data and procedure abstraction, functional programming, symbolic programming, and object-oriented programming. Graduates gain knowledge how to design and construct interpreters/compilers of LISP-like programming languages.

Class syllabus:
1. Procedure Abstraction:
basic expressions, compound procedures, high level procedures.
2. Data Abstraction:
basic data types, symbolic data, structured data, procedural data.
3. Modularity, Objects and Local State:
environment model, representing local state, stream as lists with delayed evaluation.
4. LISP Interpreter:
metainterpreter, strict and lazy evalutation, nondeterministic evaluation.
5. LISP Compiler:
register machines, register machine simulator, storage allocation, compilation.

Recommended literature:
Hal Abelson and Jerry Sussman and Julie Sussman. Structure and Interpretation of Computer Programs. MIT Press, second edition, 1996.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 1

A	B	C	D	E	FX
100,0	0,0	0,0	0,0	0,0	0,0

Lecturers: Ing. Ján Komara, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-223/15	Virtual and Extended Reality

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Continuing evaluation: project (30%) and exercise assignments (10%).
Exam: written exam (60%).
To successfully complete the course, student has to obtain at least 50% of points and the project and on the exercise assignments and at least 50% on the final exam.
Scale: A 90%, B 80%, C 70%, D 60%, E 50%.
Scale of assessment (preliminary/final): Continuing evaluation/Exam: 40/60.

Learning outcomes:
After graduating, students will understand the theoretical foundations and practical skills in creating the team applications in enhanced and virtual reality.

Class syllabus:
Virtual reality, definition of terms, history, major milestones, motivation and applications.
Augmented Reality, definition of terms, history, major milestones, motivation and applications.
Hardware for Virtual and Augmented reality
Registration and Tracking in Augmented Reality (Marker, Markerless, rgbd, GPS)
3D reconstruction
Motion capture
Visual Coherency in AR (oclusion, relighting of objects), in VR (infinity walk)

Recommended literature:
Displays: fundamentals & applications / Hainich, Rolf R., and Oliver Bimber: AK Peters/CRC Press, 2016.
Real-time rendering / Tomas Akenine-Möller, Eric Haines, Naty Hoffman. Wellesley : A. K. Peters, 2008
Augmented reality: principles and practice / Schmalstieg, Dieter, and Tobias Hollerer: Addison-Wesley Professional, 2016.

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 70

A	B	C	D	E	FX
37,14	27,14	14,29	10,0	7,14	4,29

Lecturers: RNDr. Zuzana Berger Haladová, PhD., RNDr. Martin Madaras, PhD., Mgr. Lukáš Gajdošech

Last change: 27.06.2022

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-255/15	Visual Information Processing

Educational activities:
Type of activities: lecture
Number of hours:
per week: 2 **per level/semester:** 26
Form of the course: on-site learning

Number of credits: 3

Recommended semester: 4.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: homework, projects
Indicative assessment scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
The graduate of the course will master both basic and advanced methods of video processing.

Class syllabus:
• 2D motion estimation, 3D and 2D motion modeling, and basic motion estimation methods, advanced techniques (mesh-based, global motion estimation, multi-resolution approach)
• Video segmentation, spatial and temporal
• Video stabilization, panoramic video generation, debluring
• Noise reduction, Restoration (deblurring), Superresolution, Mosaicing
• Basic compression techniques,
• Video coding: motion compensated prediction and interpolation, block-based hybrid video coding, Scalable coding
• Waveform-based coding: transform coding, predictive coding
• Stereo and multiview video processing
• Video Watermarking
• Video quality assessment

Recommended literature:
High dynamic range video / Karol Myszkowski, Rafal Mantiuk, Grzegorz Krawczyk. [s.l.] : Morgan & Claypool, 2008

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 8

A	B	C	D	E	FX
75,0	25,0	0,0	0,0	0,0	0,0

Lecturers: RNDr. Zuzana Černeková, PhD.

Last change: 18.11.2021

Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI/2-AIN-120/15	Visual Information Processing - Generic Subject

Educational activities:
Type of activities:
Number of hours:
per week: **per level/semester:**
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: II.

Prerequisites:

Course requirements:
Continuous assessment: The number of credits and the conditions of fulfillment are given by the rules of the foreign university.
Examination: written, oral
Scale of assessment (preliminary/final): 100/0

Learning outcomes:
Ability to keep in touch with the latest developments in their discipline within the subjects. After completing the course, students will learn how to study abroad, make new contacts in their field, on which they can build their professional growth, learn about a new cultural environment, learn how to adapt to a foreign team, improve communication skills.

Class syllabus:
Course in the field of advanced computer graphics and image processing. The course is intended only for students who complete part of their studies at foreign universities as part of study stays on the basis of an agreement. The choice of the subject is subject to the consent of the guarantor of the study program. The number of credits and the conditions of fulfillment are determined by the rules of the foreign university.

Recommended literature:

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 2

A	B	C	D	E	FX
0,0	50,0	50,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Roman Ďurikovič, PhD.

Last change: 18.11.2021
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KDMFI/2-AIN-224/15	Web Programming

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 3.

Educational level: II.

Prerequisites:

Course requirements:
Intermediate assessment: assignments (50%), project (50%)
Exam: practical (at least 70% of the semester points are needed)
Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 20 / 80

Learning outcomes:
The student will be able to create extensive educative web application using databases, respectively. storage and other advanced technologies for the development of dynamic web applications.

Class syllabus:
HTML5 - Canvas, Web Storage, Media, Drag & Drop
JQuery, JQueryUI, Vue.js, or another suitable framework
AJAX - manipulation of objects with their properties (also CSS), effects, event processing, efficient work with forms, etc.
Two-way communication between server and client

Recommended literature:
actual documentation for each technology
w3schools.com
own electronic texts published on the website or in the Moodle environment

Languages necessary to complete the course:
Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 194

A	B	C	D	E	FX
62,89	11,86	10,82	2,06	5,15	7,22

Lecturers: PaedDr. Roman Hrušecký, PhD.

Last change: 21.06.2022
Approved by:

COURSE DESCRIPTION

Academic year: 2021/2022

University: Comenius University Bratislava

Faculty: Faculty of Mathematics, Physics and Informatics

Course ID:	**Course title:**
FMFI.KAI+KDMFI/2-AIN-111/15	Web Technologies and Methodology

Educational activities:
Type of activities: lecture / practicals
Number of hours:
per week: 2 / 2 **per level/semester:** 26 / 26
Form of the course: on-site learning

Number of credits: 6

Recommended semester: 1.

Educational level: I., II.

Prerequisites:

Antirequisites: FMFI.KAI+KDMFI/2-AINa-111/20

Course requirements:
Semester: project 60pts, final test 15pts (minimum 50%)
Exam: oral exam 25pts (admittance requirement: 60pts from the semester)
Passing the course: 50pts altogether and 50% from the final test
Scale: A 90%, B 80%, C 70%, D 60%, E 50%
Scale of assessment (preliminary/final): 75/25

Learning outcomes:
An overview of web technologies and their applications for various purposes. Principles and methodologies of web applications, web user interfaces, and web content design.

Class syllabus:
- Overview of web technologies and web architecture
- Information architecture, types of websites, web applications, components and interfaces
- Client platforms (mobile, tablet, desktop) and implications for web design and development
- Methodologies of website and web application development (waterfall model, agile methodologies)
- Interaction design methodologies (user research and modelling, iterative prototype-based design, prototype testing)
- Principles and methodologies of web content curation
- Testing, optimization and maintenance of web applications and web content
- Website and web application quality measures

Recommended literature:
Web Style Guide, 4th ed. / P.J. Lynch, S. Horton. Yale University Press, 2016. Dostupné online: http://webstyleguide.com/
Mobile First. L. Wroblewski, A Book Apart, 2011

Languages necessary to complete the course:

Slovak, English

Notes:

Past grade distribution
Total number of evaluated students: 180

A	B	C	D	E	FX
12,22	14,44	10,0	16,67	31,67	15,0

Lecturers: doc. RNDr. Zuzana Kubincová, PhD., doc. RNDr. Martin Homola, PhD., Mgr. Ján Kľuka, PhD.

Last change: 23.06.2022

Approved by: