Recomended pass through the study plan

Name of the pass: Branch Computer Vision and Image Processing - Passage through study

Faculty/Institute/Others: Faculty of Electrical Engineering
Department: Department of Cybernetics
Pass through the study plan: Otevřená informatika - Počítačové vidění a digitální obraz
Branch of study guranteed by the department: Computer Vision and Image Processing
Guarantor of the study branch: doc. Dr. Ing. Radim Šára
Program of study: Open Informatics
Type of study: Follow-up master full-time
Note on the pass:

Coding of roles of courses and groups of courses:
P - compulsory courses of the program, PO - compulsory courses of the branch, Z - compulsory courses, S - compulsory elective courses, PV - compulsory elective courses, F - elective specialized courses, V - elective courses, T - physical training courses

Coding of ways of completion of courses (KZ/Z/ZK) and coding of semesters (Z/L):
KZ - graded assesment, Z - assesment, ZK - examination, L - summer semester, Z - winter semester

Number of semester: 1

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
A4M14BP3	**Safety in Electrical Engineering 3**	Z	0	2+2j	Z	P
A4M33PAL	**Advanced algorithms**	Z,ZK	6	2P+2C	Z	P
A4M33DZO	**Digital image**	Z,ZK	6	2P+2C	Z	PO
MOIHEM	**Humanitní, ekonomicko-manažerské předměty** *A0M16EKE,A0B16FIL,..... (see the list of groups below)*	Min. cours. 0	Min/Max 0/999			V
MOIVOLPRE	**Volitelné předměty** *A4M36BIS,A0M36BEP,..... (see the list of groups below)*	Min. cours. 0	Min/Max 0/999			V

Number of semester: 2

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
A4M35KO	**Combinatorial Optimization**	Z,ZK	6	3P+2C	L	P
A4M01TAL	**Theory of Algorithms** *Marie Demlová, Natalie Žukovec Marie Demlová (Gar.)*	Z,ZK	6	3P+1S	L	P
A4M33GVG	**Geometry of Computer Vision and Graphics**	Z,ZK	6	2P+2C	L	PO
A4M33MPV	**Computer Vision Methods**	Z,ZK	6	2P+2C	L	PO
MOIVOLPRE	**Volitelné předměty** *A4M36BIS,A0M36BEP,..... (see the list of groups below)*	Min. cours. 0	Min/Max 0/999			V

Number of semester: 3

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
A4M33TDV	**3D Computer Vision**	Z,ZK	6	2P+2C	Z	P
A4M33SAD	**Machine Learning and Data Analysis** *Filip Železný, Jiří Kléma **Filip Železný** Filip Železný (Gar.)*	Z,ZK	6	2P+2C	Z	PO
A4M39VG	**Computational Geometry**	Z,ZK	6	2P+2S	Z	PO
MOIPRO	**Softwarový nebo výzkumný projekt** *A4M38SVP,A4M36SVP,..... (see the list of groups below)*	Min. cours. 1 Max. cours.	Min/Max 6/6			P

		1				
MOIVOLPRE	**Volitelné předměty** *A4M36BIS,A0M36BEP,..... (see the list of groups below)*	Min. cours. 0	Min/Max 0/999			V

Number of semester: 4

Code	Name of the course / Name of the group of courses ***(in case of groups of courses the list of codes of their members)*** *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
ADIP25	**Diploma Thesis**	Z	25	36s	L	P
MOIVOLPRE	**Volitelné předměty** *A4M36BIS,A0M36BEP,..... (see the list of groups below)*	Min. cours. 0	Min/Max 0/999			V

List of groups of courses of this pass with the complete content of members of individual groups

Kód	Name of the group of courses and codes of members of this group (for specification see here or below the list of courses)	Completion	Credits	Scope	Semester	Role
MOIHEM	**Humanitní, ekonomicko-manažerské předměty**	**Min. cours.** **0**	**Min/Max** 0/999			**V**

A0M16EKE	Economy of Power Industry	A0B16FIL	Philosophy	A0M16FI2	Philosophy II
A0B04F1	French language 1	A7B39GRT	Graphical Design	A0B16HTE	History of technology and econom ...
A0M16HT2	History of science and technolog ...	A0B04JAP	Japanese	A0B04JAP2	Japanese 2
A6M33KSY	Cognitive Systems	A0M16MGM	Management	A0B16MPL	Management psychology
A0M16MPS	Psychology	A0B04N1	German language 1	A0B32ODV	Intellectual property protection
A4M39PUR	Psychology in HCI	A0B04TOEFL	TOEFL	A0M16TE1	Theology
A003TV	Physical Education				

MOIPRO	**Softwarový nebo výzkumný projekt**	**Min. cours.** **1** **Max. cours.** **1**	**Min/Max** 6/6			**P**

A4M38SVP	Software or Research Project	A4M36SVP	Software or Research Project	A4M31SVP	Software or Research Project
A4M35SVP	Software or Research Project	A4M39SVP	Software or Research Project	A4M33SVP	Software or Research Project

MOIVOLPRE	**Volitelné předměty**	**Min. cours.** **0**	**Min/Max** 0/999			**V**

A4M36BIS	Information and System Security	A0M36BEP	Unmanned Aerial Vehicles	A6M33BIN	Bioinformatics
AE4M39PGR	Computer Graphics	BE0M39PGR	Computer Graphics	A0M33EOA	Evolutionary Optimization Algori ...
A4M36ISS	Integration of Enterprise Softwa ...	B0M39ITT1	Applied Multimedia and Technolog ...	A0M39ITT1	Applied Multimedia and Technolog ...
B0M39ITT2	Applied Multimedia and Technolog ...	A0M39ITT2	Applied Multimedia and Technolog ...	A6M33KSY	Cognitive Systems
A0X36MOOC	Massive Open Online Course	A0B17MTB	Matlab	A6M33NIN	Neuroinformatics
A4M33NMS	Design and Modeling of Software ...	B4M39GPU	General-Purpose Computing on GPU	A4M39GPU	General-Purpose Computing on GPU
A0M33OSW	Ontologies and Semantic Web	AE0M33OSW	Ontologies and Semantic Web	A4M36JEE	Advanced Java EE lab
B4M39AIM	Advanced Interactive Image Manip ...	A4M39AIM	Advanced Interactive Image Manip ...	AE0M99PP4	Professional Practice
AE0M99PP2	Professional Practice	AE0M99PP6	Professional Practice	A4M39PGR2	Computer Graphics 2
B4M39PGR2	Computer Graphics 2	B4M39PUR	Psychology in HCI	A4M39PUR	Psychology in HCI
B4M39RSO	Realistic Image Synthesis	A4M39RSO	Realistic Image Synthesis	A4B36ACM	ACM seminar in algorithmics
A4M33SEP	A Practical Approach to Software	A4M33BDT	Big Data Technologies	A0M33KAJ	Fat Client Applications Design i ...
A4M33VIA	Internet Applications Developmen ...	A7B36TS1	Introduction to Software Testing	B4M36NLP	Introduction to Natural Language ...
A4M33RPR	Project Management				

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
A0B04F1	French language 1	Z	2
A0B04JAP	Japanese	Z	2
A0B04JAP2	Japanese 2	Z	2

A0B04N1	German language 1	Z	2
A0B04TOEFL	TOEFL	Z	4
The test of English as a Foreign Language TOEFL is an internationally accepted, standardized language exam, which allows students to show their language skills when applying for studying abroad. The course can improve the language skills taking into account the character of the exam; it will introduce the formal aspects of the exam and give strategies for taking the test. This subject is evaluated by 4 credits, which expects 3 hours of homework. Passing the TOEFL exam with minimum 100 points (the B level) by the end of the summer exam period is the requirement for getting the credit. The exam is not a part of the course and it costs 240USD. It is possible to take it in testing centers in Prague and Ostrava. The dates of the exams are published on http://www.ets.org/toefl. The validity of the exam is 2 years.			
A0B16FIL	Philosophy	ZK	2
A0B16HTE	History of technology and economic	ZK	2
A0B16MPL	Management psychology	ZK	2
Psychology of personality, psychology of work and organization. Psychology in human resources management. The manager, his role and competencies. Motivation and engagement. Skills development. Communication and conflict resolution. Work group and team, conducting meetings. Time management and delegation. Dealing with stress and emotions. Company culture and organizational change.			
A0B17MTB	Matlab	KZ	4
A0B32ODV	Intellectual property protection	KZ	4
This subject introduces the basic issues of intellectual property (IP) protection. Students learn why it is necessary to protect research results, how they can protect their own technical solutions and designs, how to obtain a trademark and also how to succeed with IP protection at the international level. The course also deals with license granting procedures for particular protection methods as part of a standard way of commercializing original IP. Emphasis is put on quality methodology for database searching, which is key for successful research and development projects. Motto: Those who do not protect the results of their research work can never dream of being on par with the best?			
A0M16EKE	Economy of Power Industry	KZ	4
Fundamentals of financing of power companies. Cost structure of power generation and distribution. Prices and tariff systems for power, heat and gas production and distribution. Examples of economic evaluation and investment appraisal of the typical project in power sector. Renewable energy sources, externalities. Energy policy and energy law in CR. Liberalization and power market development.			
A0M16FI2	Philosophy II	Z,ZK	4
The course is oriented on the transdisciplinar aspects of philosophy, informatics, physics, mathematics and biology.			
A0M16HT2	History of science and technology 2	Z,ZK	4
This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers			
A0M16MGM	Management	Z,ZK	5
The methods and procedures of effective management for company leading in competitors area.			
A0M16MPS	Psychology	Z,ZK	4
A0M16TE1	Theology	Z,ZK	4
This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our civilization up.			
A0M33EOA	Evolutionary Optimization Algorithms	Z,ZK	6
The course aims at issues related to the application of evolutionary algorithms in practice and at the methods used to solve them. Evolutionary algorithms are optimization metaheuristics that use analogies with natural evolution to solve complex optimization tasks. The course builds on and extends knowledge from the course Bio-inspired algorithms. In the seminar and lab lectures, the students will get hands-on tutorials and will be obliged to implement their own evolutionary algorithm to solve an optimization task as part of their project.			
A0M33KAJ	Fat Client Applications Design in Javascript	KZ	4
A0M33OSW	Ontologies and Semantic Web	KZ	4
The course "Ontologies and Semantic Web" will guide students through current trends and technologies in the semantic web field. Students will learn designing complex ontologies, thesauri, formalizing them in a suitable formal language, querying them and creating semantic web applications on their top. The second part of the course will be devoted to the efficient management of ontological data and other selected topics.			
A0M36BEP	Unmanned Aerial Vehicles	Z,ZK	4
The course is dedicated to students interested in unmanned aerial systems (UASs). It includes lectures aimed at airplane construction, engines, sensors, electronic systems,servos, control electronics, control algorithms and one course presents law issues related to UASs from the flight approval and control perspectives. The course is extended with an educational excursion to relevant laboratories. Seminar projects are related to Procerus UAV in the field of sensor data processing including participation on the experimental flight.			
A0M39ITT1	Applied Multimedia and Technology I	KZ	6
The two-semester course is realized in cooperation of Academy of Performing Arts and Czech Technical University. The target group for the course are students of art academy and technical faculties interesting in connection of technologies and art applications. The content of the course is characterized as work with space and time through images, light and sound using technical and software tools. The course has form of seminaries, workshops, team work, and excursions. The student projects given in the first semester are then realized in summer semester during course The art of intermedia and technologies II. The technical equipment of laboratory is accessible to students under conditions specified on start of the course. The actual information about the course are presented on website of Institute of intermedia: http://vyuka.iim.cz/y39itt:y39itt.			
A0M39ITT2	Applied Multimedia and Technology II	KZ	6
The course continues the course The Art of Intermedia and Technologies from the previous semester, which is organized in cooperation of Czech technical University in Prague and Academy of Performing Arts in Prague. The goal of the course is realization of student projects, designed in the previous semester, and presentation of the results in public. It is expected that students will apply knowledge given them during the course of ITT and also in therms of other courses passed during the previous study. The technical equipment of laboratory is accessible to students under conditions specified on start of the course. The actual information about the course are presented on website of Institute of intermedia: http://vyuka.iim.cz/y39itt:y39itt.			
A0X36MOOC	Massive Open Online Course	Z	2
See https://cw.fel.cvut.cz/b172/courses/a0x36mooc/start for additional details.			
A4B36ACM	ACM seminar in algorithmics	KZ	4
A4M01TAL	Theory of Algorithms	Z,ZK	6
The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes P, NP, NP-complete, PSPACE and NPSPACE are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZZP introduced.			
A4M14BP3	Safety in Electrical Engineering 3	Z	0
The course provides for students of programme Open informatics periodic training guidelines for health and occupational safety and gives knowledge of electrical hazard of given branch of study. Students receive indispensable qualification according to the Directive of the Dean No. 1/2007.			

A4M31SVP	Software or Research Project	KZ	6
A4M33BDT	Big Data Technologies	KZ	3
The objective of this elective course is to familiarize students with new trends and technologies for storing, management and processing of Big Data. The course will focus on methods for extraction, analysis as well as a selection of hardware infrastructure for managing persistent and streamed data, such as data from social networks. As part of the course we will present how to apply the traditional methods of artificial intelligence and machine learning to Big Data analysis.			
A4M33DZO	Digital image	Z,ZK	6
First, the subject teaches how to process two-dimensional image as a signal without interpretation. Image acquisition, linear and nonlinear preprocessing methods and image compression will be studied. Second, image segmentation and registration methods will be taught. Studied topics will be practised on practical examples in order to obtain also practical skills.			
A4M33GVG	Geometry of Computer Vision and Graphics	Z,ZK	6
We will explain fundamentals of image and space geometry including Euclidean, affine and projective geometry, the model of a perspective camera, image transformations induced by camera motion, and image normalization for object recognition. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry of objects by a camera, and reconstructing geometrical properties of objects from their projections. We will build on linear algebra and optimization and lay down foundation for other subjects such as computational geometry, computer vision, computer graphics, digital image processing and recognition of objects in images.			
A4M33MPV	Computer Vision Methods	Z,ZK	6
The course covers selected computer vision problems: search for correspondences between images via interest point detection, description and matching, image stitching, detection, recognition and segmentation of objects in images and videos, image retrieval from large databases and tracking of objects in video sequences.			
A4M33NMS	Design and Modeling of Software Systems	Z,ZK	6
The subject introduces to the design process of a software system from requirements gathering to a detailed object-oriented design. It is based on existing development methodologies, especially object-oriented, and the UML language will be used as a dominant formalism. The subject is oriented mainly on reliability analysis and formal and informal methods to reduce error rate in design phases.			
A4M33PAL	Advanced algorithms	Z,ZK	6
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - syntax analysis and pattern matching.			
A4M33RPR	Project Management	KZ	3
A4M33SAD	Machine Learning and Data Analysis	Z,ZK	6
The course explains machine learning methods helpful for getting insight into data by automatically discovering interpretable data models such as graph- and rule-based. The course will also address a theoretical framework explaining why/when the explained algorithms can in principle be expected to work. The lectures are given in English.			
A4M33SEP	A Practical Approach to Software	Z,ZK	6
The course A Practical Approach to The Software Engineering systematically covers primary and support software engineering activities. Further, software project management, software process, software maintenance and software proposal writing will be mentioned for an appropriate context. All topics covered will be illustrated on real world project situations. A typical lecture will include theory basics, minimal practices, checklists and templates, samples from real world projects and recommended reading.			
A4M33SVP	Software or Research Project	KZ	6
A4M33TDV	3D Computer Vision	Z,ZK	6
This course introduces methods and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and their essence well enough to be able to build variants of simple systems for reconstruction of 3D objects from a set of images or video, for inserting virtual objects to video-signal source, or for computing ego-motion trajectory from a sequence of images. The labs will be hands-on, the student will be gradually building a small functional 3D scene reconstruction system.			
A4M33VIA	Internet Applications Development	Z	3
This course will teach current Internet technologies and how to use them. We will show the growth of the Internet, sources of data and how to use them for WEB applications development. Text search is an essential web app and we will learn the basic techniques. We will focus on the most frequently used app on the web - search. We will explain the basics for the REST API design and usage. We will review the basic AJAX architecture from an application point of view. We also discuss knowledge DBs. We also plan to show conversational applications. The course will be closed with the introduction to Big Data and the Internet of Things.			
A4M35KO	Combinatorial Optimization	Z,ZK	6
The goal is to show the problems and algorithms of combinatorial optimization (often called discrete optimization; there is a strong overlap with the term operations research). Following the courses on linear algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programming, heuristics, approximation algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources, scheduling in production lines, message routing, scheduling in parallel computers.			
A4M35SVP	Software or Research Project	KZ	6
A4M36BIS	Information and System Security	Z,ZK	6
The goal of the course is to give the students a basic gasp of information/system security problems and solutions. Rather than teaching specific current technologies and vulnerabilities/threats, we will introduce general problems, formalize them if appropriate and illustrate them with a wide range of examples, both with current and legacy technologies. We put emphasis on problems that will be encountered by most programmers and developers through their careers.			
A4M36ISS	Integration of Enterprise Software System Services	KZ	4
The purpose is to familiarize students with software systems integration and application design patterns for integration. The course offers introduction to technology for controlling the flow of messages, their transformation across formats, integration of business rules, event management, distributed transaction management, etc. The course provides a complete overview of service-oriented architectures (SOA), focusing on the integration of services and business rules or heterogeneous systems. Outside decentralized software design for SOA students learn to design? Microservice Architecture ?, which allows independent deployment and management of individual system components and services. Besides the above mentioned students learn to work with cloud services access Platform as a Service (PaaS), which is characterized by distinctive features for the development and integration services including seamless migration to cloud-based applications. Students will learn standard specifications for modularization systems in Java - Open Service Gateway Initiative (OSGi). The last part of the course is focused integration services for mobile platforms, both in terms of frontend and backend mobile connectivity options.			
A4M36JEE	Advanced Java EE lab	KZ	4
Advanced topics on Java EE, intor to Java EE 7, Context and Dependency Injection, EJB 3.1, DeltaSpike, what is missing in the standard. Securing applications over JAAS. Cloud management, clustering and scaling, infinispan, management and monitoring of enterprise aplication servers, implementation of enterprise application. Course consists of three intensive days (lecture and practice; december). Bring your PC.			
A4M36SVP	Software or Research Project	KZ	6
Individual project work under the advisors supervision. During this course it is possible (usual) to work on a particular problem within the Diploma thesis. Therefore, we advise students to choose the subject of the Diploma thesis already at the beginning of the 3rd semester and not to underestimate this timely choice. To pass the course Software and research project the result of the work has to be clearly defined, e.g. technical report or the piece of software (program), that will be awarded the assessment. Important note: In general, it is not possible to pass more than one course of this type/with such characteristics. An exception can be granted by guarantor of the major specialization. Possible reason for an exception could be a fact, that the work/project has got a different subject and is supervised by a different advisor. Typically, it can be a project done during the studies abroad. For further information please contact: oi@fel.cvut.cz			
A4M38SVP	Software or Research Project	KZ	6

A4M39AIM	Advanced Interactive Image Manipulation	Z,ZK	4
This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms that are both easy to implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also valuable outside the domain of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR compression, de-blurring in frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conversion, context enhancement, interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, adding depth, alpha matting.			
A4M39GPU	General-Purpose Computing on GPU	KZ	4
The goal of the course is to introduce students to basic principles of General-Purpose Computing on Graphics Processing Units (GPGPU). Course gives an overview of architecture and capabilities of modern graphics processing units (GPUs) and covers elementary concepts in parallel programming on GPUs. Students will gain programming skills with the CUDA (or OpenCL) technology and become familiar with basic parallel algorithms (e.g. parallel prefix scan/reduction) that are building blocks for design and implementation of efficient parallel algorithms.			
A4M39PGR2	Computer Graphics 2	Z,ZK	6
The course introduces advanced modeling and rendering techniques, capabilities of modern graphic accelerators, and metods for their programming. Focus is given on theoretical and practical experiences with OpenGL graphical library and with its extensions. Students learn GLSL language together with programming of graphical cards on the graphical pipeline level (vertex and fragment shaders].			
A4M39PUR	Psychology in HCI	KZ	4
The aim of the course is that students will master all phases of the research process starting from initial planning up to the translation of their observations into innovative design concepts, so they are able to run applied research projects themselves. Overall the emphasis is laid on practitioner's approach and developing skills needed for adopting these technique in daily design practice across various domains.			
A4M39RSO	Realistic Image Synthesis	Z,ZK	6
We deal with techniques and algorithms for global illumination used in realistic rendering. The lectures partly complete the missing part of continuous mathematics required for this subject and numerical integration methods. The related physics underlying the rendering equation is shortly described which includes the surface reflectance. Most of the lectures are devoted to particular rendering algorithms for virtual and augmented reality. The use of GPUs for rendering algorithms are described within the last lectures.			
A4M39SVP	Software or Research Project	KZ	6
Individual work on a problem/project under the supervision of the supervisor, typically a sub-problem of diploma thesis. We recommend to choose the topic of diploma theses not later than at the beginning of the third semester. The project must have a clearly defined output, e.g. the technical report or a program and is awarded by classified assesment. Details can be found on the web page of the department of Computer Graphics and Interaction http://dcgi.felk.cvut.cz/cs/study/predmetprojekt.			
A4M39VG	Computational Geometry	Z,ZK	6
The goal of computational geometry is analysis and design of efficient algorithms for determining properties and relations of geometric entities. The lecture focuses on geometric search, point location, convex hull construction for sets of points in d-dimensional space, searching nearest neighbor points, computing intersection of polygonal areas, geometry of parallelograms. New directions in algorithmic design. Computational geometry is applied not only in geometric applications, but also in common database searching problems.			
A6M33BIN	Bioinformatics	Z,ZK	5
The course will explain the principles of algorithms employed for processing biological data at the molecular level, in particular those algorithms that are used for genome sequencing, comparing of biological sequences (primarily genes), their probabilistic and grammatical modeling, for search of associations between primary and higher structures of proteins, their functions and interactions, for analyzing high-throughput data (mainly gene expression data) and for system-biological modeling of processes such as metabolism or gene expression regulation. The course will also cover some neccessary elements of molecular biology as well as basic principles of technologies for the measurement of data that are to be processed by the instructed algorithms.			
A6M33KSY	Cognitive Systems	KZ	4
This subject is conceived as the introduction to the cognitive psychology for the students of technical schools. The mind is considered as the information processing system in this approach so the students should find some similarities with the computational and mathematical theories. The lectures are divided to the several sections copying the way of informational processing in the human brain. There are lectures focused attention, perception, reasoning, mental imagery, knowledge representation and language acquisition. In the practical lessons student undergo experiments that demonstrates theories from the lectures.			
A6M33NIN	Neuroinformatics	Z,ZK	5
The Neuroinformatics Course concentrates on modelling of neurons, stochastic learning on cellular level, information coding and decoding in brain and single unit processing. Examples from clinical practices are provided throughout the course. The labs focus on signal neuron analysis from human and animal brain.			
A7B36TS1	Introduction to Software Testing	KZ	5
A7B39GRT	Graphical Design	KZ	5
The course grants an overview of graphical design and typography. It includes also a practical training in creating graphical design of electronical documents and hand drawing.			
ADIP25	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
AE0M33OSW	Ontologies and Semantic Web	KZ	4
The course "Ontologies and Semantic Web" will guide students through current trends and technologies in the semantic web field. Students will learn designing complex ontologies, thesauri, formalizing them in a suitable formal language, querying them and creating semantic web applications on their top. The second part of the course will be devoted to the efficient management of ontological data and other selected topics. All course materials are in English. In case all attendees are Czech speaking Czech can be spoken.			
AE0M99PP2	Professional Practice	Z	2
AE0M99PP4	Professional Practice	Z	4
AE0M99PP6	Professional Practice	Z	6
AE4M39PGR	Computer Graphics	Z,ZK	6
Graphical libraries are used for realistic rendering of 3D scenes. The main goal of this course is to introduce students to to the Application Programming Interface (API) for 3D graphics and learn them how to program a simple interactive OpenGL based 3D graphical applications. Naturally, the course describes the fundamentals of computer graphics such as rendering pipeline, geometric transformations, texturing, scene modeling, shading and illumination models, etc. Lectures also cover advanced modeling techniques (parametric curves and surfaces) and selected topics related to the scientific visualization. Practices are focused on the work on given tasks and individual projects that help students to get practical experience with the OpenGL graphics library.			
B0M39ITT1	Applied Multimedia and Technology I	KZ	6
The two-semester course is realized in cooperation of Academy of Performing Arts and Czech Technical University. The target group for the course are students of art academy and technical faculties interesting in connection of technologies and art applications. The content of the course is characterized as work with space and time through images, light and sound using technical and software tools. The course has form of seminaries, workshops, team work, and excursions. The student projects given in the first semester are then realized in summer semester during course The art of intermedia and technologies II. The technical equipment of laboratory is accessible to students under conditions specified on start of the course. The actual information about the course are presented on website of Institute of intermedia: http://vyuka.iim.cz/y39itt:y39itt.			

B0M39ITT2	Applied Multimedia and Technology II	KZ	6
The course continues the course The Art of Intermedia and Technologies from the previous semester, which is organized in cooperation of Czech technical University in Prague and Academy of Performing Arts in Prague. The goal of the course is realization of student projects, designed in the previous semester, and presentation of the results in public. It is expected that students will apply knowledge given them during the course of ITT and also in therms of other courses passed during the previous study. The technical equipment of laboratory is accessible to students under conditions specified on start of the course. The actual information about the course are presented on website of Institute of intermedia: http://vyuka.iim.cz/y39itt:y39itt.			
B4M36NLP	Introduction to Natural Language Processing	Z,ZK	6
B4M39AIM	Advanced Interactive Image Manipulation	Z,ZK	4
This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms that are both easy to implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also valuable outside the domain of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR compression, de-blurring in frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conversion, context enhancement, interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, adding depth, alpha matting.			
B4M39GPU	General-Purpose Computing on GPU	KZ	4
The goal of the course is to introduce students to basic principles of General-Purpose Computing on Graphics Processing Units (GPGPU). Course gives an overview of architecture and capabilities of modern graphics processing units (GPUs) and covers elementary concepts in parallel programming on GPUs. Students will gain programming skills with the CUDA (or OpenCL) technology and become familiar with basic parallel algorithms (e.g. parallel prefix scan/reduction) that are building blocks for design and implementation of efficient parallel algorithms.			
B4M39PGR2	Computer Graphics 2	Z,ZK	6
The course introduces advanced modeling and rendering techniques, capabilities of modern graphic accelerators, and metods for their programming. Focus is given on theoretical and practical experiences with OpenGL graphical library and with its extensions. Students learn GLSL language together with programming of graphical cards on the graphical pipeline level (vertex and fragment shaders].			
B4M39PUR	Psychology in HCI	KZ	6
The aim of the course is that students will master all phases of the research process starting from initial planning up to the translation of their observations into innovative design concepts, so they are able to run applied research projects themselves. Overall the emphasis is laid on practitioner's approach and developing skills needed for adopting these technique in daily design practice across various domains.			
B4M39RSO	Realistic Image Synthesis	Z,ZK	6
We deal with techniques and algorithms for global illumination used in realistic rendering. The lectures partly complete the missing part of continuous mathematics required for this subject and numerical integration methods. The related physics underlying the rendering equation is shortly described which includes the surface reflectance. Most of the lectures are devoted to particular rendering algorithms for virtual and augmented reality. The use of GPUs for rendering algorithms are described within the last lectures.			
BE0M39PGR	Computer Graphics	Z,ZK	6
Graphical libraries are used for realistic rendering of 3D scenes. The main goal of this course is to introduce students to to the Application Programming Interface (API) for 3D graphics and learn them how to program a simple interactive OpenGL based 3D graphical applications. Naturally, the course describes the fundamentals of computer graphics such as rendering pipeline, geometric transformations, texturing, scene modeling, shading and illumination models, etc. Lectures also cover advanced modeling techniques (parametric curves and surfaces) and selected topics related to the scientific visualization. Practices are focused on the work on given tasks and individual projects that help students to get practical experience with the OpenGL graphics library.			

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