

Study plan

Name of study plan: Open Informatics - Computer Vision and Image Processing

Faculty/Institute/Others: Faculty of Electrical Engineering

Department: Department of Cybernetics

Branch of study guaranteed by the department:

Garantor of the study branch: doc. Dr. Ing. Radim Šára

Program of study: Open Informatics

Type of study: Follow-up master full-time

Required credits: 85

Elective courses credits: 35

Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 49

The role of the block: P

Code of the group: 2018_MOIEP

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 24 credits

Requirement courses in the group: In this group you have to complete 4 courses

Credits in the group: 24

Note on the group:

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
BE4M33PAL	Advanced Algorithms Marko Genyk-Berezovskij, Daniel Průša Daniel Průša Daniel Průša (Gar.)	Z,ZK	6	2P+2C	Z	P
BE4M35KO	Combinatorial Optimization Zdeněk Hanzálek Zdeněk Hanzálek	Z,ZK	6	3P+2C	L	P
BE4MSVP	Software or Research Project Petr Pošík, Jaroslav Sloup, Katarína Ťakušová Katarína Ťakušová	KZ	6		Z,L	P
BE4M01TAL	Theory of Algorithms Marie Demlová, Natalie Žukovec Marie Demlová Marie Demlová (Gar.)	Z,ZK	6	3P+2S	L	P

Characteristics of the courses of this group of Study Plan: Code=2018_MOIEP Name=Compulsory subjects of the programme

BE4M33PAL	Advanced Algorithms	Z,ZK	6
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern matching.			
BE4M35KO	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.			
BE4MSVP	Software or Research Project	KZ	6
BE4M01TAL	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 ZPP introduced.			

Code of the group: 2018_MOIEDIP

Name of the group: Diploma Thesis

Requirement credits in the group: In this group you have to gain 25 credits

Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 25

Note on the group:

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
BDIP25	Diploma Thesis	Z	25	22s	L	P

Characteristics of the courses of this group of Study Plan: Code=2018_MOIEDIP Name=Diploma Thesis

BDIP25	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.		
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Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 36

The role of the block: PO

Code of the group: 2018_MOIEPO5

Name of the group: Compulsory subjects of the branch

Requirement credits in the group: In this group you have to gain 36 credits

Requirement courses in the group: In this group you have to complete 6 courses

Credits in the group: 36

Note on the group:

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
BE4M39VG	Computational Geometry Petr Felkel Petr Felkel Petr Felkel (Gar.)	Z,ZK	6	2P+2S	Z	PO
BE4M33MPV	Computer Vision Methods Milan Sulc, Jiří Matas, Jan Čech, Ondřej Drbohlav Ondřej Drbohlav Jiří Matas (Gar.)	Z,ZK	6	2P+2C	L	PO
BE4M33DZO	Digital Image Václav Hlaváč Václav Hlaváč Václav Hlaváč (Gar.)	Z,ZK	6	2P+2C	Z	PO
BE4M33GVG	Geometry of Computer Vision and Graphics Martin Matoušek, Tomáš Pajdla Tomáš Pajdla Tomáš Pajdla (Gar.)	Z,ZK	6	2P+2C	L	PO
BE4M33SSU	Statistical Machine Learning Jan Drchal, Vojtěch Franc, Boris Flach Vojtěch Franc Boris Flach (Gar.)	Z,ZK	6	2P+2C	Z	PO
BE4M33TDV	Three-dimensional Computer Vision Radim Šára Radim Šára Radim Šára (Gar.)	Z,ZK	6	2P+2C	Z	PO

Characteristics of the courses of this group of Study Plan: Code=2018_MOIEPO5 Name=Compulsory subjects of the branch

BE4M39VG	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.		
BE4M33MPV	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.		
BE4M33DZO	Digital Image	Z,ZK	6	The subject teaches how to represent the two-dimensional image in a computer, how to process it and interpret it. The first part of the subject deals with the image as with the signal without interpretation. Image acquisition, linear and nonlinear preprocessing methods and image compression will be explicated. In the second part, image segmentation and registration methods will be taught. Studied topics will be practiced on practical examples in order to obtain also practical skills.		
BE4M33GVG	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.		
BE4M33SSU	Statistical Machine Learning	Z,ZK	6	The aim of statistical machine learning is to develop systems (models and algorithms) able to learn to solve tasks given a set of examples and some prior knowledge about the task. This includes typical tasks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning concepts such as risk minimisation, maximum likelihood estimation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classification and regression and to show how they can be learned by those concepts.		
BE4M33TDV	Three-dimensional 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 and using it to compute a virtual 3D model of an object of his/her choice.		

Name of the block: Elective courses

Minimal number of credits of the block: 0

Code of the group: 2018_MOIEVOL

Name of the group: Elective subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: ~Student can choose arbitrary subject of the magister's program (EEM - Electrical Engineering, Power Engineering and Management, EK - Electronics and Communications, KYR - Cybernetics and Robotics, OI - Open Informatics, OES - Open Electronics Systems) which is not part of his curriculum. Student can choose with consideration of recommendation of the branch guarantee. You can find a selection of optional courses organized by the departments on the web site <http://www.fel.cvut.cz/cz/education/volitelne-predmety.html>

List of courses of this pass:

Code	Name of the course	Completion	Credits
BDIP25	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.			
BE4M01TAL	Theory of Algorithms	Z,ZK	6
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BE4MSVP	Software or Research Project	KZ	6

For updated information see <http://bilakniha.cvut.cz/en/f3.html>

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