

Study plan

Name of study plan: Open Informatics - Bioinformatics

Faculty/Institute/Others: Faculty of Electrical Engineering
 Department: Department of Computer Science
 Branch of study guaranteed by the department: Bioinformatics
 Garantor of the study branch:
 Program of study: Open Informatics
 Type of study: Follow-up master full-time
 Required credits: 84
 Elective courses credits: 36
 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: 2015_MOIDIP
 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=2015_MOIDIP 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.						

Code of the group: 2015_MOIP
 Name of the group: Compulsory subjects of the programm
 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
B4M35KO	Combinatorial Optimization	Z,ZK	6	3P+2C	L	P
B4M33PAL	Advanced algorithms Marko Genyk-Berezovskyj, Daniel Pr ša Daniel Pr ša Daniel Pr ša (Gar.)	Z,ZK	6	2P+2C	Z	P
B4MSVP	Software or Research Project Ivan Jelínek, Jaroslav Sloup, Martin Šipoš, Drahomíra Hejtmánová, Jana Zichová, Petr Pošík, Martin Hlinovský, Katarína akušová Jaroslav Sloup	KZ	6		Z,L	P
B4M01TAL	Theory of Algorithms	Z,ZK	6	3P+2S	L	P

Characteristics of the courses of this group of Study Plan: Code=2015_MOIP Name=Compulsory subjects of the programm

B4M35KO	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.						

B4M33PAL	Advanced algorithms Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern matching.	Z,ZK	6
B4MSVP	Software or Research Project	KZ	6
B4M01TAL	Theory of Algorithms 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.	Z,ZK	6

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 35

The role of the block: PO

Code of the group: 2015_MOIPO8

Name of the group: Compulsory subjects of the branch

Requirement credits in the group: In this group you have to gain 35 credits

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

Credits in the group: 35

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
B4M36BIN	Bioinformatics	Z,ZK	5	2P+2C	L	PO
B4M33DZO	Digital image Václav Hlavá , Radoslav Škoviera Václav Hlavá Václav Hlavá (Gar.)	Z,ZK	6	2P+2C	Z	PO
B4M36MBG	Molecular Biology and Genetics	Z,ZK	6	3P+1C	L	PO
BE4M33SSU	Statistical Machine Learning Jan Drchal, Vojtěch Franc, Boris Flach Vojtěch Franc Boris Flach (Gar.)	Z,ZK	6	2P+2C	Z	PO
B4M36SAN	Statistical Data Analysis Jiří Kléma Jiří Kléma Jiří Kléma (Gar.)	Z,ZK	6	2P+2C	Z	PO
B4M36SMU	Symbolic Machine Learning	Z,ZK	6	2P+2C	L	PO

Characteristics of the courses of this group of Study Plan: Code=2015_MOIPO8 Name=Compulsory subjects of the branch

B4M36BIN	Bioinformatics	Z,ZK	5
B4M33DZO	Digital image 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.	Z,ZK	6
B4M36MBG	Molecular Biology and Genetics	Z,ZK	6
BE4M33SSU	Statistical Machine Learning 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.	Z,ZK	6
B4M36SAN	Statistical Data Analysis This course builds on the skills developed in introductory statistics courses. It is practically oriented and gives an introduction to applied statistics. It mainly aims at multivariate statistical analysis and modelling, i.e., the methods that help to understand, interpret, visualize and model potentially high-dimensional data. It can be seen as a purely statistical counterpart to machine learning and data mining courses.	Z,ZK	6
B4M36SMU	Symbolic Machine Learning The course will explain methods through which an intelligent agent can learn, that is, improve its behavior from observed data and background knowledge. The learning scenarios will include on-line learning and learning from i.i.d. data (along with the PAC theory of learnability), as well as the active and reinforcement learning scenarios. Symbolic knowledge representations (mainly through logic and graphs) will be used where possible. The course is given in English to all students.	Z,ZK	6

Name of the block: Elective courses

Minimal number of credits of the block: 0

The role of the block: V

Code of the group: MTV

Name of the group: T lesná výchova

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

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
TVV	Physical education	Z	0	0+2	Z,L	v
TVV0	Physical education	Z	0	0+2	Z,L	v
TV-V1	Physical education	Z	1	0+2	Z,L	v
TVKLV	Physical Education Course	Z	0	7dní	L	v
TVKZV	Physical Education Course	Z	0	7dní	Z	v

Characteristics of the courses of this group of Study Plan: Code=MTV Name=T lesná výchova

TVV	Physical education	Z	0
TVV0	Physical education	Z	0
TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0

Code of the group: 2015_MOIVOL

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:

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách

<http://www.fel.cvut.cz/cz/education/volitelne-predmety.html>

List of courses of this pass:

Code	Name of the course	Completion	Credits
B4M01TAL	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.			
B4M33DZO	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.			
B4M33PAL	Advanced algorithms	Z,ZK	6
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern matching.			
B4M35KO	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.			
B4M36BIN	Bioinformatics	Z,ZK	5
B4M36MBG	Molecular Biology and Genetics	Z,ZK	6
B4M36SAN	Statistical Data Analysis	Z,ZK	6
This course builds on the skills developed in introductory statistics courses. It is practically oriented and gives an introduction to applied statistics. It mainly aims at multivariate statistical analysis and modelling, i.e., the methods that help to understand, interpret, visualize and model potentially high-dimensional data. It can be seen as a purely statistical counterpart to machine learning and data mining courses.			
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B4MSVP	Software or Research Project	KZ	6
BDIP25	Diploma Thesis	Z	25
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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.

TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

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

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