

# Study plan

## Name of study plan: Open Informatics - Artificial Intelligence

Faculty/Institute/Others: Faculty of Electrical Engineering  
Department:  
Branch of study guaranteed by the department: Welcome page  
Garantor of the study branch:  
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\_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, <b>authors</b> and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BDIP25	<b>Diploma Thesis</b>	Z	25	22s	L	P

### Characteristics of the courses of this group of Study Plan: Code=2018\_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: 2018\_MOIP  
Name of the group: Compulsory subjects of the program  
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, <b>authors</b> and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B4M35KO	<b>Combinatorial Optimization</b> Zden k Hanzálek <b>Zden k Hanzálek</b> Zden k Hanzálek (Gar.)	Z,ZK	6	3P+2C	L	P
B4M33PAL	<b>Advanced algorithms</b> Marko Genyk-Berezovskij, Daniel Pr ša, Ond ej Drbohlav <b>Daniel Pr ša</b> Daniel Pr ša (Gar.)	Z,ZK	6	2P+2C	Z	P
B4MSVP	<b>Software or Research Project</b> Ivan Jelínek, Jaroslav Sloup, Ji í Šebek, Martin Šipoš, Drahomíra Hejtmánová, Jana Zichová, Petr Pošík, Martin Hlinovský, Katarína Žmolíková, ..... <b>Ivan</b> <b>Jelínek</b> Ivan Jelínek (Gar.)	KZ	6		Z,L	P
B4M01TAL	<b>Theory of Algorithms</b> Marie Demlová, Natalie Žukovec <b>Marie Demlová</b> Marie Demlová (Gar.)	Z,ZK	6	3P+2S	L	P

### Characteristics of the courses of this group of Study Plan: Code=2018\_MOIP Name=Compulsory subjects of the program

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

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\_MOIPO7

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
B4M36LUP	<b>Logical Reasoning and Programming</b> <i>Ond ej Kuželka, Karel Chvalovský Filip Železný Filip Železný (Gar.)</i>	Z,ZK	6	2P+2C	Z	PO
B4M36PUI	<b>Artificial Intelligence Planning</b> <i>Rostislav Horík Rostislav Horík Michal Pchou ek (Gar.)</i>	Z,ZK	6	2P+2C	L	PO
BE4M33SSU	<b>Statistical Machine Learning</b> <i>Jan Dirchal, Vojt ch Franc Vojt ch Franc Vojt ch Franc (Gar.)</i>	Z,ZK	6	2P+2C	Z	PO
B4M36SMU	<b>Symbolic Machine Learning</b> <i>Ond ej Kuželka, Filip Železný, Gustav Šír Ond ej Kuželka Ond ej Kuželka (Gar.)</i>	Z,ZK	6	2P+2C	L	PO
B4M36UIR	<b>Artificial Intelligence in Robotics</b> <i>Miloš Prágr, Jan Faigl Jan Faigl Jan Faigl (Gar.)</i>	Z,ZK	6	2P+2C	Z	PO
B4M36MAS	<b>Computational Game Theory</b> <i>Tomáš Kroupa, Michal Jakob, Ond ej Kubí ek, Tomáš Votroubek Tomáš Kroupa Michal Pchou ek (Gar.)</i>	Z,ZK	6	2P+2C	Z	PO

Characteristics of the courses of this group of Study Plan: Code=2018\_MOIPO7 Name=Compulsory subjects of the branch

B4M36LUP	Logical Reasoning and Programming	Z,ZK	6
The course's aim is to explain selected significant methods of computational logic. These include algorithms for propositional satisfiability checking, logical programming in Prolog, and first-order theorem proving and model-finding. Time permitting, we will also discuss some complexity and decidability issues pertaining to the said methods.			
B4M36PUI	Artificial Intelligence Planning	Z,ZK	6
The course covers the problematic of automated planning in artificial intelligence and focuses especially on domain independent models of planning problems: planning as a search in the space of states (state-space planning), in the space of plans (plan-space planning), heuristic planning, planning in graph representation of planning problems (graph-plan) or hierarchical planning. The students will also learn about the problematic of planning under uncertainty and the planning model as a decision-making in MDP and POMDP.			
BE4M33SSU	Statistical Machine Learning	Z,ZK	6
The aim of statistical machine learning is to develop systems (models and algorithms) for learning 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.			
B4M36SMU	Symbolic Machine Learning	Z,ZK	6
This course consists of four parts. The first part of the course will explain methods through which an intelligent agent can learn by interacting with its environment, also known as reinforcement learning. This will include deep reinforcement learning. The second part focuses on Bayesian networks, specifically methods for inference. The third part will cover fundamental topics from natural language learning, starting from the basics and ending with state-of-the-art architectures such as transformer. Finally, the last part will provide an introduction to several topics from the computational learning theory, including the online and batch learning settings.			
B4M36UIR	Artificial Intelligence in Robotics	Z,ZK	6
The course aims to acquaint students with the use of planning approaches and decision-making techniques of artificial intelligence for solving problems arising in autonomous robotic systems. Students in the course are employing knowledge of planning algorithms, game theory, and solving optimization problems in selected application scenarios of mobile robotics. Students first learn architectures of autonomous systems based on reactive and behavioral models of autonomous systems. The considered application scenarios and robotic problems include path planning, persistent environmental monitoring, robotic exploration of unknown environments, online real-time decision-making, deconfliction in autonomous systems, and solutions of antagonistic conflicts. In laboratory exercises, students practice their problem formulations of robotic challenges and practical solutions in a realistic robotic simulator or consumer mobile robots. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at <a href="https://prg.ai/minor">https://prg.ai/minor</a> .			

B4M36MAS	Computational Game Theory	Z,ZK	6
This course is designed to introduce students to the fundamental concepts and applications of game theory, a powerful tool used to model strategic interactions among individuals, organizations, or countries. Throughout the course, we will delve into various aspects of game theory and explore its wide-ranging applications in diverse fields, including machine learning and AI.			

Name of the block: Elective courses  
Minimal number of credits of the block: 0  
The role of the block: V

Code of the group: 2018\_MOIH  
Name of the group: Humanities subjects  
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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
B0M16FIL	<i>Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16HVT	<b>History of science and technology 2</b> <i>Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16HSD1	<b>History of economy and social studies</b> <i>Marcela Efmertová</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16PSM	<b>Psychology</b> <i>Jan Fiala Jan Fiala Jan Fiala (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16TEO	<b>Theology</b> <i>Vladimír Sláma ka Vladimír Sláma ka Vladimír Sláma ka (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v

**Characteristics of the courses of this group of Study Plan: Code=2018\_MOIH Name=Humanities subjects**

B0M16FIL		Z,ZK	5
B0M16HVT	History of science and technology 2	Z,ZK	5
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			
B0M16HSD1	History of economy and social studies	Z,ZK	5
This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.			
B0M16PSM	Psychology	Z,ZK	5
B0M16TEO	Theology	Z,ZK	5
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 grows our civilization up.			

Code of the group: MTV  
Name of the group: Physical education  
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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
TVV	<b>Physical education</b>	Z	0	0+2	Z,L	v
A003TV	<b>Physical Education</b> <i>Ji í Drnek</i>	Z	2	0+2	L,Z	v
TV-V1	<b>Physical education</b>	Z	1	0+2	Z,L	v
TVV0	<b>Physical education</b>	Z	0	0+2	Z,L	v
TVKLV	<b>Physical Education Course</b>	Z	0	7dní	L	v
TVKZV	<b>Physical Education Course</b>	Z	0	7dní	Z	v

**Characteristics of the courses of this group of Study Plan: Code=MTV Name=Physical education**

TVV	Physical education	Z	0
A003TV	Physical Education	Z	2

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

Code of the group: 2018\_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:

~The offer of elective courses arranged by departments can be found on the website  
<https://fel.cvut.cz/en/education/volitelne-predmety.html>

### List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
B0M16FIL		Z,ZK	5
B0M16HSD1	History of economy and social studies	Z,ZK	5
This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.			
B0M16HVT	History of science and technology 2	Z,ZK	5
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			
B0M16PSM	Psychology	Z,ZK	5
B0M16TEO	Theology	Z,ZK	5
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 grows our civilization up.			
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.			
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.			
B4M36LUP	Logical Reasoning and Programming	Z,ZK	6
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B4M36UIR	Artificial Intelligence in Robotics	Z,ZK	6
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consumer mobile robots. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at <https://prg.ai/minor>.

B4MSVP	Software or Research Project	KZ	6
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.			
BE4M33SSU	Statistical Machine Learning	Z,ZK	6
The aim of statistical machine learning is to develop systems (models and algorithms) for learning 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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