

# Study plan

## Name of study plan: Open Informatics - Computer Engineering

Faculty/Institute/Others: Faculty of Electrical Engineering

Department: Department of Measurement

Branch of study guaranteed by the department:

Garantor of the study branch: doc. Ing. Jiří Novák, Ph.D.

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	<b>Advanced Algorithms</b> Marko Genyk-Berezovskij, Daniel Prša, Daniel Prša (Gar.)	Z,ZK	6	2P+2C	Z	P
BE4M35KO	<b>Combinatorial Optimization</b> Zdeněk Hanzálek	Z,ZK	6	3P+2C	L	P
BE4MSVP	<b>Software or Research Project</b> Jiří Šebek, Petr Pošík, Jaroslav Šloup, Katarína akušová, Petr Pošík	KZ	6		Z,L	P
BE4M01TAL	<b>Theory of Algorithms</b>	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 Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern matching.	Z,ZK	6
BE4M35KO	Combinatorial Optimization 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.	Z,ZK	6
BE4MSVP	Software or Research Project Independent work on a problem under the guidance of an advisor. Usually but not mandatory, the problem being solved is a subproblem of approaching diploma thesis and the project advisor is the diploma thesis supervisor too. Therefore, we recommend choosing the topic of the diploma thesis at the beginning of the 3rd semester and not underestimating its timely selection. The topic of the project should be relevant to the major branch of the study. The software and research project course must have a clearly defined output, such as a technical report or a computer program. The output is defended, evaluated and graded. Important note: - By default, it is not possible to complete more than one subject of this type. - An exception may be granted by the guarantor of the major branch of the study. A possible reason for granting an exemption is that the work-project has a different topic and is led by another supervisor. A typical example is working on a project abroad. Note: The student enrolls in the course of SVP at the department of the supervisor. If the course does not list the course, then at the department 13139 (variant A4M39SVP). The contact email in case of further questions: oi@fel.cvut.cz. More instructions for entering and elaborating the project can be found on the website of the Department of Computer Graphics and Interaction <a href="http://dcgi.felk.cvut.cz/cs/study/predmetprojekt">http://dcgi.felk.cvut.cz/cs/study/predmetprojekt</a> .	KZ	6
BE4M01TAL	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

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) <i>Tutors, authors and guarantors (gar.)</i>	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\_MOIEPO4

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
BE4M35PAP	Advanced Computer Architectures <i>Pavel Piša, Karel Koříš Pavel Piša Pavel Piša (Gar.)</i>	Z,ZK	6	2P+2C	Z	PO
BE4M38AVS	Application of Embedded Systems	Z,ZK	6	2P+2L	L	PO
BE4M38KRP	Computer Interfaces <i>Jiří Novák Jiří Novák Jiří Novák (Gar.)</i>	Z,ZK	6	2P+2L	Z	PO
BE4M36ESW	Effective Software	Z,ZK	6	2P+2C	L	PO
BE4M35PAG	Parallel algorithms <i>P emysl Š cha P emysl Š cha P emysl Š cha (Gar.)</i>	Z,ZK	6	2P+2S	Z	PO
BE4M34ISC	Systems on Chip <i>Jiří Jakovenko, Vladimír Janík Jiří Jakovenko Jiří Jakovenko (Gar.)</i>	Z,ZK	6	2P+2L	Z	PO

Characteristics of the courses of this group of Study Plan: Code=2018\_MOIEPO4 Name=Compulsory subjects of the branch

BE4M35PAP	Advanced Computer Architectures	Z,ZK	6			
BE4M38AVS	Application of Embedded Systems	Z,ZK	6			
This course presents applications of embedded systems and their specifics. It is expected that the students have had a programming course, and thus the course is more oriented on explaining and describing the blocks and functions of embedded systems and their use in signal processing, rather than writing code. After completing this course, students should have an overview of usability and power of available processors, and their peripherals, on the basis of which, they should be able to independently design embedded systems for a wide spectrum of applications.						
BE4M38KRP	Computer Interfaces	Z,ZK	6			
Students are acquainted with functional principles of computers and embedded systems communication interfaces and with a design of typical peripherals. Technologies like USB, PCI, and PCI Express, wired and wireless computer and sensor networks as well as industrial distributed systems like CAN and LIN are introduced. Project oriented laboratories will allow students to become familiar with implementation of communication hardware and software into the real devices, including their support in operating systems.						
BE4M36ESW	Effective Software	Z,ZK	6			
Within the course of Efficient software you will get familiar with the area of software and algorithm optimization under limited resources. The course is focused on the efficient usage of modern hardware architectures - multi-core and multi-processor systems with shared memory. Students will practically implement and use presented techniques in C and Java. Main topics are: code optimization, effective data structures and processor cache usage, data structures in multi-threaded applications and implementation of efficient network servers.						
BE4M35PAG	Parallel algorithms	Z,ZK	6			
In the introductory lectures, we will focus on general approaches to design of parallel algorithms and their properties important for understanding the fundamental principles of parallel and distributed algorithms. Subsequently we will talk about fundamental parallel algorithms; typically, constituting cornerstones of algorithms for real-world problems. The laboratory exercise will be aimed at hardware platform commonly used in practice.						
BE4M34ISC	Systems on Chip	Z,ZK	6			
Main responsibilities of integrated circuits designer; design abstraction levels - Y chart. Specification designation, feasibility study, criteria for technology and design kits selection. Analogue and digital integrated systems design and simulation methodologies. Main features of application specific ICs - full custom design, gate arrays, standard cells, programmable array logic. Design aspects mobile and low power systems. Hardware Description languages (HDL). Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenche construction and verification.						

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 master'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
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.			
BE4M33PAL	Advanced Algorithms	Z,ZK	6
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern matching.			
BE4M34ISC	Systems on Chip	Z,ZK	6
Main responsibilities of integrated circuits designer; design abstraction levels - Y chart. Specification designation, feasibility study, criteria for technology and design kits selection. Analogue and digital integrated systems design and simulation methodologies. Main features of application specific ICs - full custom design, gate arrays, standard cells, programmable array logic. Design aspects mobile and low power systems. Hardware Description languages (HDL). Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenche construction and verification.			
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.			
BE4M35PAG	Parallel algorithms	Z,ZK	6
In the introductory lectures, we will focus on general approaches to design of parallel algorithms and their properties important for understanding the fundamental principles of parallel and distributed algorithms. Subsequently we will talk about fundamental parallel algorithms; typically, constituting cornerstones of algorithms for real-world problems. The laboratory exercise will be aimed at hardware platform commonly used in practice.			
BE4M35PAP	Advanced Computer Architectures	Z,ZK	6
BE4M36ESW	Effective Software	Z,ZK	6
Within the course of Efficient software you will get familiar with the area of software and algorithm optimization under limited resources. The course is focused on the efficient usage of modern hardware architectures - multi-core and multi-processor systems with shared memory. Students will practically implement and use presented techniques in C and Java. Main topics are: code optimization, effective data structures and processor cache usage, data structures in multi-threaded applications and implementation of efficient network servers.			
BE4M38AVS	Application of Embedded Systems	Z,ZK	6
This course presents applications of embedded systems and their specifics. It is expected that the students have had a programming course, and thus the course is more oriented on explaining and describing the blocks and functions of embedded systems and their use in signal processing, rather than writing code. After completing this course, students should have an overview of usability and power of available processors, and their peripherals, on the basis of which, they should be able to independently design embedded systems for a wide spectrum of applications.			
BE4M38KRP	Computer Interfaces	Z,ZK	6
Students are acquainted with functional principles of computers and embedded systems communication interfaces and with a design of typical peripherals. Technologies like USB, PCI, and PCI Express, wired and wireless computer and sensor networks as well as industrial distributed systems like CAN and LIN are introduced. Project oriented laboratories will allow students to become familiar with implementation of communication hardware and software into the real devices, including their support in operating systems.			
BE4MSVP	Software or Research Project	KZ	6
Independent work on a problem under the guidance of an advisor. Usually but not mandatory, the problem being solved is a subproblem of approaching diploma thesis and the project advisor is the diploma thesis supervisor too. Therefore, we recommend choosing the topic of the diploma thesis at the beginning of the 3rd semester and not underestimating its timely selection. The topic of the project should be relevant to the major branch of the study. The software and research project course must have a clearly defined output, such as a technical report or a computer program. The output is defended, evaluated and graded. Important note: - By default, it is not possible to complete more than one subject of this type. - An exemption may be granted by the guarantor of the major branch of the study. A possible reason for granting an exemption is that the work-project has a different topic and is led by another supervisor. A typical example is working on a project abroad. Note: The student enrolls in the course of SVP at the department of the supervisor. If the course does not list the course,			

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

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