# Study plan

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

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:

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Name of the block: Compulsory courses in the program
Minimal number of credits of the block: 49
The role of the block: P

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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** *Ondřej Drbohlav, Marko Genyk-Berezovskyj, Daniel Průša* ***Daniel Průša*** *Daniel Průša (Gar.)* | Z,ZK | 6 | 2P+2C | Z | P |
| BE4M35KO | **Combinatorial Optimization** *Zdeněk Hanzálek* ***Zdeněk Hanzálek*** *Zdeněk Hanzálek (Gar.)* | Z,ZK | 6 | 3P+2C | L | P |
| BE4MSVP | **Software or Research Project** *Jiří Šebek, Petr Pošík, Jaroslav Sloup, Katarína Žmolíková, Tomáš Drábek* ***Petr Pošík*** | 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**

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|---|---|---|---|
| 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 |
| 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 http: //dcgi.felk. cvut.cz/cs/study/predmetprojekt. | | | |
| 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 ZZP introduced. | | | |

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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**

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| 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

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Code of the group: 2018_MOIEPO6
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 |
|---|---|---|---|---|---|---|
| BE4M36DS2 | **Database systems 2** *Yuliia Prokop **Yuliia Prokop** Yuliia Prokop (Gar.)* | Z,ZK | 6 | 2P+2C | Z | PO |
| BE4M36ESW | **Effective Software** *Michal Sojka, David Šišlák **David Šišlák** David Šišlák (Gar.)* | Z,ZK | 6 | 2P+2C | L | PO |
| BE4M36BSY | **Introduction to Computer Security** *Sebastián García, Tomáš Pevný, Veronica Valeros, Ondřej Lukáš, Maria Rigaki, Martin Řepa, Lukáš Forst, Muris Sladić **Tomáš Pevný** Tomáš Pevný (Gar.)* | Z,ZK | 6 | 2P+2C | Z | PO |
| BE4M35PAG | **Parallel algorithms** *Přemysl Šůcha **Přemysl Šůcha** Přemysl Šůcha (Gar.)* | Z,ZK | 6 | 2P+2S | Z | PO |
| BE4M36SWA | **Software Architectures** *Karel Frajták, Miroslav Bureš **Karel Frajták** Miroslav Bureš (Gar.)* | Z,ZK | 6 | 2P+2C | L | PO |
| BE4M36ZKS | **Software Quality Assurance** *Karel Frajták, Miroslav Bureš, Matěj Klíma **Miroslav Bureš** Miroslav Bureš (Gar.)* | Z,ZK | 6 | 2P+2C | Z | PO |

**Characteristics of the courses of this group of Study Plan: Code=2018_MOIEPO6 Name=Compulsory subjects of the branch**

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| BE4M36DS2 | Database systems 2 | Z,ZK | 6 |

The aim is to introduce new trends in database systems to students. We will focus primarily on the current issues of Big Data and the associated problems of distributed storage and processing of data. We will introduce a so-called basic types of NoSQL databases and also the related issue of cloud computing, data storage and distributed computations over large data files.

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| 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 implmenet 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.

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|---|---|---|---|
| BE4M36BSY | Introduction to Computer Security | Z,ZK | 6 |

This course aims to teach students cybersecurity fundamentals by combining penetration testing with defense strategies. Using an innovative blend of lectures and practical tutorials, students engage in highly interactive classes. Each new concept is immediately reinforced with hands-on exercises, allowing students to apply what they have learned in real-time. Throughout the semester, the course integrates both attack and defense techniques. In realistic scenarios accessed via a cyber range, students will practice a wide range of skills: reconnaissance, scanning, exploiting vulnerabilities, privilege escalation, lateral movement, exfiltration, malware analysis, network security forensics, binary reversing, log analysis, intrusion detection systems, honeypots, and applications of machine learning and AI in cybersecurity. Classes are in English. Teachers speak English, Czech, Spanish, Greek, and Bosnian.

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| 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.

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|---|---|---|---|
| BE4M36SWA | Software Architectures | Z,ZK | 6 |

In this course students become familiar with the general requirements for software (SW) architecture and related quality parameters that are monitored by software architectures. Individual requirements and parameters are discussed in the context of current architectural standards and design patterns that students practically learn through exercises. In this course, besides the technology perspective on software architecture is also taken into an account the management aspect.

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|---|---|---|---|
| BE4M36ZKS | Software Quality Assurance | 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: 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 themagister'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 ZZP 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. | | | |
| BE4M35KO | Combinatorial Optimization | Z,ZK | 6 |
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| 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. | | | |
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| BE4M36DS2 | Database systems 2 | Z,ZK | 6 |
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| BE4M36ZKS | Software Quality Assurance | Z,ZK | 6 |
| BE4MSVP | Software or Research Project | KZ | 6 |
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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 http: //dcgi.felk. cvut.cz/cs/study/predmetprojekt.

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