

Study plan

Name of study plan: Bc. Branch WSI, Specialization Software Engineering, Presented in English, Version 2015-2020

Faculty/Institute/Others:

Department: Department of Software Engineering

Branch of study guaranteed by the department: Software Engineering (Bachelor, in English)

Garantor of the study branch: prof. Dr. Ing. Petr Kroha, CSc.

Program of study: Informatics (in English)

Type of study: Bachelor full-time

Required credits: 158

Elective courses credits: 22

Sum of credits in the plan: 180

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 119

The role of the block: PP

Code of the group: BIE-PP.2015

Name of the group: Compulsory Courses of Study Program Informatics, Presented in English, Version 2015

Requirement credits in the group: In this group you have to gain 119 credits

Requirement courses in the group: In this group you have to complete at least 21 courses

Credits in the group: 119

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
BIE-AG1	Algorithms and Graphs 1 Jiřina Scholtzov, Pavel Tvrđik Pavel Tvrđik Pavel Tvrđik (Gar.)	Z,ZK	6	2P+2C	Z	PP
BIE-AAG	Automata and Grammars Jan Holub, Jan Trvniek, Ondřej Guth, Jan Janoušek, Martin Svoboda Radomír Polach Jan Holub (Gar.)	Z,ZK	6	2P+2C	Z	PP
BIE-BPR	Bachelor Project Dana Vynikarov	Z	2		Z	PP
BIE-BAP	Bachelor Thesis Miroslav Balík Zdeněk Muzikř (Gar.)	Z	14		L,Z	PP
BIE-PSI	Computer Networks Vladimír Smotlacha, Yelena Trofimova Alexandru Moucha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-SAP	Computer Structures and Architectures Pavel Kubalík, Jiří Douša, Petr Fišer Petr Fišer Jiří Douša (Gar.)	Z,ZK	6	2P+1R+2C	L	PP
BIE-DBS	Database Systems Yelena Trofimova, Josef Pavlıek Miroslav Balík Josef Pavlıek (Gar.)	Z,ZK	6	3L	Z,L	PP
BIE-CAO	Digital and Analog Circuits Kateřina Hyniov Miroslav Balík Kateřina Hyniov (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-DPR	Document., Presentation, Rhetorics Ondřej Guth, Dana Vynikarov, Petra Pavlıkov Ondřej Guth Dana Vynikarov (Gar.)	KZ	4		L	PP
BIE-ZMA	Elements of Calculus Jitka Rybnckov Tomš Kalvoda Tomš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BIE-ZDM	Elements of Discrete Mathematics Josef Kolř Miroslav Balík Josef Kolř (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-PAI	Law and Informatics Alžbeta Krausov, Martin Myřka, Michal Matějka, Zdeněk Kuera Miroslav Balík Zdeněk Kuera (Gar.)	ZK	3	2P	Z	PP
BIE-LIN	Linear Algebra Pavel Hrabk Karel Klouda (Gar.)	Z,ZK	7	4P+2C	L	PP
BIE-MLO	Mathematical Logic Jitka Rybnckov, Kateřina Trlıfajov Kateřina Trlıfajov (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-OSY	Operating Systems Pavel Tvrđik, Michal Štepanovsk Pavel Tvrđik (Gar.)	Z,ZK	5	2P+1R+1L	L	PP

BIE-PST	Probability and Statistics <i>Petr Novák Petr Novák (Gar.)</i>	Z,ZK	5	2P+1R+1C	Z	PP
BIE-PA1	Programming and Algorithmics 1 <i>Jan Trávníček, Ladislav Vagner, Miroslav Balík, Josef Vogel Jan Trávníček Ladislav Vagner (Gar.)</i>	Z,ZK	6	2P+2R+2C	Z	PP
BIE-PA2	Programming and Algorithmics 2 <i>Jan Trávníček, Ladislav Vagner, Josef Vogel Jan Trávníček Ladislav Vagner (Gar.)</i>	Z,ZK	7	2P+1R+1C	L	PP
BIE-PS1	Programming in Shell 1 <i>Jan Trdlička Jan Zďárek Jan Trdlička (Gar.)</i>	KZ	5	2P+2C	Z	PP
BIE-BEZ	Security <i>Róbert Lórencz, Jiří Buček Róbert Lórencz (Gar.)</i>	Z,ZK	6	2P+1R+1C	L	PP
BIE-SI1.2	Software Engineering I <i>Zdeněk Rybala Zdeněk Rybala Zdeněk Rybala (Gar.)</i>	Z,ZK	5	2P+1C	Z,L	PP

Characteristics of the courses of this group of Study Plan: Code=BIE-PP.2015 Name=Compulsory Courses of Study Program Informatics, Presented in English, Version 2015

BIE-AG1	Algorithms and Graphs 1 The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle practically the asymptotic mathematics.	Z,ZK	6			
BIE-AAG	Automata and Grammars Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions and regular grammars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between formal languages and automata. Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation, and design of digital circuits.	Z,ZK	6			
BIE-BPR	Bachelor Project At the beginning of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that student will perform during the semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.	Z	2			
BIE-BAP	Bachelor Thesis	Z	14			
BIE-PSI	Computer Networks Students understand the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks focusing primarily the 2nd to 4th layer of the ISO OSI model. They also get a basic understanding of communication media, security, and network administration. Students will be able to write a simple network application and configure a simple network.	Z,ZK	5			
BIE-SAP	Computer Structures and Architectures Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools.	Z,ZK	6			
BIE-DBS	Database Systems Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level module does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores.	Z,ZK	6			
BIE-CAO	Digital and Analog Circuits Students get the fundamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models and principles of functionality of transistors, gates, circuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the differences between analog and digital modes of electronic devices.	Z,ZK	5			
BIE-DPR	Document., Presentation, Rhetorics This subject is aimed to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create and prepare interactive presentations and presenting before an audience. Students will also learn to write technical reports and scientific texts. There is no fixed schedule for BIE-DPR. A teacher will contact you before the start of the semester.	KZ	4			
BIE-ZMA	Elements of Calculus Students acquire knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking and reasoning and are able to use basic proof techniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the links between the integrals and sums of sequences. They are able to estimate lower or upper bounds of values of real functions and to handle simple asymptotic expressions.	Z,ZK	6			
BIE-ZDM	Elements of Discrete Mathematics Students get both a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula approximation, and tools for solving recurrent equations.	Z,ZK	5			
BIE-PAI	Law and Informatics Students have knowledge of fundamental protection of intangible property, overview of contractual aspects of copyright. They are able to design an appropriate contract-based copyright protection and do research and verification of the outputs concerning trademarks, patents, industrial design rights. They are able to participate actively in the proceedings to register intangible property. They have a good overview of the Czech Republic legislation as well as the EU legislation.	ZK	3			
BIE-LIN	Linear Algebra Students understand the theoretical foundation of algebra and mathematical principles of linear models of systems around us, where the dependencies among components are only linear. They know the basic methods for operating with polynomials and linear spaces. They are able to perform matrix operations and solve systems of linear equations. They can apply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand error-detecting and error-correcting codes.	Z,ZK	7			
BIE-MLO	Mathematical Logic An introduction to propositional and predicate logic.	Z,ZK	5			
BIE-OSY	Operating Systems Students understand the classical theory of operating systems (OS) in addition to the knowledge gained in the BI-PS1 module. They get a solid knowledge of OS kernels, processes and threads implementations. They understand the problems of race conditions and principles and algorithms for critical sections, thread scheduling, resource allocation, deadlocks. They understand the techniques of managing virtual memory, principles and architectures of disks and disk arrays, file systems and peripheral devices. They gain basic knowledge necessary for developing system applications or for system administration. They are able to design and implement simple multithreaded applications.	Z,ZK	5			

BIE-PST	Probability and Statistics	Z,ZK	5
The students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods of determining the statistical dependence of two or more random variables.			
BIE-PA1	Programming and Algorithmics 1	Z,ZK	6
Students learn to construct algorithms for solving basic problems and write them in the C language. They understand data types (simple, structured, pointers), expressions, statements, functions, concept of recursion. They learn the basics of algorithm complexity analysis. They know fundamental algorithms for searching, sorting, and manipulating with linked lists.			
BIE-PA2	Programming and Algorithmics 2	Z,ZK	7
Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queue, enlargeable array, set, table). They can implement linked structures. They learn these skills using the programming language C++. Although this is not a module of programming in C++, students are introduced to all C++ features needed to achieve the main objective (e.g., operator overloading, templates).			
BIE-PS1	Programming in Shell 1	KZ	5
Students understand the basic principles of operating systems (processes and threads, file systems, access rights, memory management, network interface) with a focus on UNIX like operating systems. In practically oriented exercises, they will learn to use shell, basic commands and filters for processing text data.			
BIE-BEZ	Security	Z,ZK	6
Students understand the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric and asymmetric cryptosystems, and hash functions. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptosystems for computer systems. They are able to properly and securely use cryptographic primitives and systems that are based on these primitives. Students are introduced to legal aspects of information security, security standards, social engineering, and basic principles of security management.			
BIE-SI1.2	Software Engineering I	Z,ZK	5
Students learn the methods of analysis and design of large software systems, which are typically designed and implemented in teams. Students will get acquainted with CASE tools using a visual modeling language UML for modeling and solving software-related problems. Students will get an overview of object-oriented analysis, design, architecture, validation, verification, and testing processes. The knowledge obtained in the lectures is practiced on a team project. If enrolled for the BIE-SP1 course running in parallel (only summer semester), the students can work on a single more complex project and they are classified to both courses for a single project. This course does not teach the students programming, nor any particular technology, framework or programming language. The students are required to have some knowledge of these to apply them on their team project.			

Name of the block: Povinné předměty zaměření

Minimal number of credits of the block: 29

The role of the block: PZ

Code of the group: BIE-PZ-WSI-SI.2015

Name of the group: Compulsory Courses of Bachelor Specialization Software Engineering, in English, Version 2015

Requirement credits in the group: In this group you have to gain 29 credits

Requirement courses in the group: In this group you have to complete 7 courses

Credits in the group: 29

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
BIE-KOM	Conceptual Modelling <i>Robert Pergl, Marek Suchánek Robert Pergl Robert Pergl (Gar.)</i>	Z,ZK	5	2P+2C	Z	PZ
BIE-TJV	Java Technology <i>Josef Pavlíček Ondřej Guth Josef Pavlíček (Gar.)</i>	Z,ZK	4	2P+2C	Z	PZ
BIE-OOP	Object-Oriented Programming <i>Petr Máj, Stéphane Ducasse, Filip Kříkava, Jan Blizničenko Robert Pergl Filip Kříkava (Gar.)</i>	Z,ZK	4	2P+2C	Z	PZ
BIE-PPA	Programming Paradigms <i>Tomáš Pecka, Jan Janoušek, Petr Máj, Radomír Polách Petr Máj Petr Máj (Gar.)</i>	Z,ZK	5	2P+2C	Z	PZ
BIE-SI2.3	Software Engineering 2 <i>Petr Špaček Petr Špaček Petr Kroha (Gar.)</i>	Z,ZK	3	2P	Z	PZ
BIE-SP1	Team Software Project 1 <i>Zdeněk Rybola Zdeněk Rybola Zdeněk Rybola (Gar.)</i>	KZ	4	2C	Z	PZ
BIE-SP2.2	Team Software Project 2 <i>Zdeněk Rybola Zdeněk Rybola Zdeněk Rybola (Gar.)</i>	KZ	4		Z	PZ

Characteristics of the courses of this group of Study Plan: Code=BIE-PZ-WSI-SI.2015 Name=Compulsory Courses of Bachelor Specialization Software Engineering, in English, Version 2015

BIE-KOM	Conceptual Modelling	Z,ZK	5
The course focuses on the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn the ability to distinguish key concepts in the domain, categorize and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students will learn the basics of ontological structural modeling in OntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Students will also learn the basics of Enterprise Engineering as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn the DEMO methodology. The course is also designed with regard to the continuity of software implementations.			

BIE-TJV	Java Technology	Z,ZK	4
The subject goal is to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programming. This subject presents how to build the three and more layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestWeb services, JNDI etc.). At the course end is student able to create three layers enterprise application.			
BIE-OOP	Object-Oriented Programming	Z,ZK	4
Students will learn the pure object-oriented paradigm, being a tool for effective implementation of quality, evolvable business software systems. They will understand fundamentals and they will learn how to apply it for solving typical implementation tasks. Students will learn syntax and programming fundamentals of a pure OO open-source technology Pharo. Various other modern programming languages utilising the OO concepts will be introduced in the subject, as well.			
BIE-PPA	Programming Paradigms	Z,ZK	5
BIE-SI2.3	Software Engineering 2	Z,ZK	3
Students will learn to work methodically with respect to software development methodic, especially Unified Process methodic and Unified Modeling Language (UML). They will understand the functions of individual roles in a typical software team, as well as get a practical experience with them in the concurrent BIE-SP2 module. Students will also get an idea about software testing and measuring software quality. This knowledge will get extended with a practical experience thanks to the concurrently running BIE-SP2 module.			
BIE-SP1	Team Software Project 1	KZ	4
In this course, students work on a complex team project applying all the knowledge obtained in the BIE-SI1.2 course. There are no lectures and no seminars/tutorials in this course. This course is to be enrolled in parallel with BIE-SI1.2 course.			
BIE-SP2.2	Team Software Project 2	KZ	4
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BIE-SP1 course project. However, this time, the functionality, testing, and documentation of the system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their solution.			

Name of the block: Compulsory elective economic-management courses

Minimal number of credits of the block: 4

The role of the block: VE

Code of the group: BIE-PV-EM.2015

Name of the group: Compulsory Elective Economics, and Management Courses, in English, Version 2015

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 10)

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

Credits in the group: 4

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
BIE-EPR	Economic project Tomáš Evan Michal Valenta Tomáš Evan (Gar.)	Z	1		L	VE
BIE-FTR.1	Financial Markets Pavla Vozárová Pavla Vozárová Pavla Vozárová (Gar.)	Z,ZK	5	2P+2C	L	VE
BIE-MIK	Fundamentals of Microeconomics Pavla Vozárová Pavla Vozárová Pavla Vozárová (Gar.)	Z,ZK	4	2P+2C	Z	VE
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	VE

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-EM.2015 Name=Compulsory Elective Economics, and Management Courses, in English, Version 2015

BIE-EPR	Economic project	Z	1
This course is an extension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will contact you before the start of the semester.			
BIE-FTR.1	Financial Markets	Z,ZK	5
Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.			
BIE-MIK	Fundamentals of Microeconomics	Z,ZK	4
This is an introductory course of microeconomics designed for students without previous economic background. It describes different market regimes and ways how firm can react to consumer demand, competitor strategies, government intervention, uncertainty and information asymmetry. All concepts are illustrated on real life examples.			
BIE-EHD	Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.			

Name of the block: Povinné ekonomické

Minimal number of credits of the block: 4

The role of the block: PE

Code of the group: BIE-PP-EM.2015

Name of the group: Compulsory Economics and Management Bachelor Courses, in English, Version 2015

Requirement credits in the group: In this group you have to gain 4 credits

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

Credits in the group: 4

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
BIE-EMP	Economic and management principles Tomáš Evan Tomáš Evan (Gar.)	KZ	4	2P+2C	Z,L	PE

Characteristics of the courses of this group of Study Plan: Code=BIE-PP-EM.2015 Name=Compulsory Economics and Management Bachelor Courses, in English, Version 2015

BIE-EMP	Economic and management principles	KZ	4
This course is aimed to fundamental problems of business economy. The course makes students familiar with a life cycle of business, specifically with fields: enterprise foundation, enterprise putting into state economic environment (CR), management of property and capital structure, business transaction records keeping during an accounting period, a relation between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination.			

Name of the block: Compulsory elective humanities courses

Minimal number of credits of the block: 2

The role of the block: VH

Code of the group: BIE-PV-HU.2015

Name of the group: Compulsory Elective Bachelor Social Courses, Presented in English, Ver. 2015

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 9)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 3)

Credits in the group: 2

Note on the group:

Faculty guarantees the availability of these modules.

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
BIE-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	VH
FI-HPZ	Humanities subject from a study abroad Miroslav Balík	Z	3	0+0	Z,L	VH
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	VH
AE0B16F11	Philosophy I Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)	KZ	4	2+2s	Z,L	VH

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-HU.2015 Name=Compulsory Elective Bachelor Social Courses, Presented in English, Ver. 2015

BIE-EHD	Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.			
BIE-HMI	History of Mathematics and Informatics	Z,ZK	3
Students will master the methods traditionally used in mathematics and related disciplines - informatics - from different periods of the development of mathematics, and will thus become acquainted with mathematical methods suitable for applications in contemporary computer science.			
FI-HPZ	Humanities subject from a study abroad	Z	3
A "Humanities subject that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module that is required in the curriculum. The substitution is approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.			
AE0B16F11	Philosophy I	KZ	4
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			

Name of the block: Elective courses

Minimal number of credits of the block: 0

The role of the block: V

Code of the group: BIE-V-PRO_MG

Name of the group: Elective Courses, Suitable for those who intend to apply for Master's program at FIT, in English

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: Modules in this group are recommended for students who intend to enroll to master program at FIT.

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
BIE-EFA	Efficient Algorithms Jiřina Scholtzov	Z,ZK	5	2P+2C	Z	v
BIE-GRA	Graph Algorithms and Complexity Theory Miroslav Balk	Z,ZK	5	2P+2C	L	v

Characteristics of the courses of this group of Study Plan: Code=BIE-V-PRO_MG Name=Elective Courses, Suitable for those who intend to apply for Master's program at FIT, in English

BIE-EFA	Efficient Algorithms	Z,ZK	5	Students get an overview of efficient algorithms and data structures for solving classical algorithmic problems, such as searching and sorting, on dynamically changing data sets. Students are able to design and implement such algorithms, to use methods for analysing their computational and memory complexity. They understand the sorting algorithms with $O(n \cdot \log n)$ time complexity, special sorting algorithms with linear complexity, algorithms for associative and address searching. They are able to use the efficient dynamic data structures, such as hash tables, search trees, balanced search trees, heaps, B-trees, and others. They are able to work with recursive algorithms and dynamic programming.		
BIE-GRA	Graph Algorithms and Complexity Theory	Z,ZK	5	Students get an overview of typical usages of graph models in computing. They learn algorithmic methods of solving graph problems. They understand algorithms for the key application domains of graph theory (flows in networks, heuristic search, approximation of complex problems). Students get basic competence in computer science background: they understand Turing machine models and issues of NP-completeness and NP-hardness.		

Code of the group: BIE-WSI-SI-VO.2017

Name of the group: Elective Vocational Courses for Bachelor Specialisation BIE-WSI-SI, Version 2017

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: Oborove predmety vsech oboru vcetne povinnych predmetu zameření s vyjimkou zameření BIE-WSI-SI-VO.2017

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
BIE-AG2	Algorithms and Graphs 2 Jiřina Scholtzov Jiřina Scholtzov Jiřina Scholtzov (Gar.)	Z,ZK	5	2P+2C	L	v
BIE-APS.1	Architectures of Computer Systems Pavel Tvrdik, Michal Štepanovsky Jiř Buek Pavel Tvrdik (Gar.)	Z,ZK	5	2P+2C	Z	v
BIE-BIG	DB Technologies for Big Data Josef Gattermayer Josef Gattermayer Josef Gattermayer (Gar.)	KZ	4	2P+2C	Z	v
BIE-VZD	Data Mining Karel Klouda, Kamil Dedecius Pavel Kordk Pavel Kordk (Gar.)	Z,ZK	4	2P+2C	Z	v
BIE-HWB	Hardware Security Robert Lorencz, Jiř Buek, Filip Kodytek Jiř Buek Robert Lorencz (Gar.)	Z,ZK	5	2P+2C	Z	v
BIE-PJP	Programming Languages and Compilers Radomr Polach Radomr Polach Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	v
BIE-VWM	Searching Web and Multimedia Databases	Z,ZK	5	2P+1C	L	v
BIE-BEK	Secure Code Josef Kokeš, Robert Lorencz Robert Lorencz Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	v
BIE-SSB	System and Network Security Alexandru Moucha	Z,ZK	5	2P+2C	Z	v
BIE-ADU.1	Unix Administration Zdenek Muzikr, Miroslav Pragl, Jan Źdarek Jan Źdarek Zdenek Muzikr (Gar.)	Z,ZK	5	2P+2C	L	v
BIE-TWA.1	Web Application Design Petr Klan Petr Klan (Gar.)	Z,ZK	5	2P+2C	Z	v
BIE-ADW.1	Windows Administration Miroslav Pragl, Jiř Kašpar Miroslav Pragl Miroslav Pragl (Gar.)	Z,ZK	4	2P+1C	Z	v
BIE-XML	XML Technology	Z,ZK	4	2P+2C	Z	v

Characteristics of the courses of this group of Study Plan: Code=BIE-WSI-SI-VO.2017 Name=Elective Vocational Courses for Bachelor Specialisation BIE-WSI-SI, Version 2017

BIE-AG2	Algorithms and Graphs 2	Z,ZK	5			
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BIE-APS.1	Architectures of Computer Systems	Z,ZK	5
Students understand architectures of uniprocessor computers at the level of machine instructions, with emphasis to instruction pipelining and memory hierarchy. They know the main concepts of RISC and CISC architectures. They learn how modern computers work and how they are constructed. They learn about the techniques that today's processors use to increase the program execution speed. They have a basic knowledge allowing them to optimise their programs to fully exploit a given processor architecture. They get an idea about the trends in the area of computer architectures and how they will affect software. They also understand the architectures of vector processors, their use in today's microprocessors. They understand the principles of shared-memory multiprocessor system architectures and the issues of memory consistency.			
BIE-BIG	DB Technologies for Big Data	KZ	4
Students are introduced into the field of Big Data. These are data that the standard relational databases cannot process efficiently due to the size, and at the same time, their real-time processing can provide information that can have key importance for the competitiveness of a company or organization. The course is focused practically. Students learn the most important professional technologies, such as Apache Cassandra, Apache Hadoop, Apache Solr, and others. The course brings to students theoretical foundation of algorithms used in Big data systems. In the labs, students learn to develop their own applications on top of these technologies.			
BIE-VZD	Data Mining	Z,ZK	4
Students are introduced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multidimensional data visualization, statistical techniques of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic data mining tools to common problems (classification, regression, clustering).			
BIE-HWB	Hardware Security	Z,ZK	5
The course deals with hardware resources used to ensure security of computer systems including embedded ones. The students become familiar with the operating principles of cryptographic modules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of ciphers.			
BIE-PJP	Programming Languages and Compilers	Z,ZK	5
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs for parsing and processing text in a language defined by a LL(1) grammar.			
BIE-VWM	Searching Web and Multimedia Databases	Z,ZK	5
Students gain basic knowledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogeneous data repository. In particular, the students will understand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity retrieval methods focused on heterogeneous multimedia databases (unstructured data collections, respectively).			
BIE-BEK	Secure Code	Z,ZK	5
The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them.			
BIE-SSB	System and Network Security	Z,ZK	5
The students will understand the public key infrastructure (PKI), its strengths and weaknesses, its vulnerabilities against attacks. The students will also understand the analysis of network protocols from the perspectives of: authentication and authorisation, key exchange, and encryption. They get an overview of the security mechanisms of operating systems (OSs), of the ways virtualization can be used to protect OSs, and of the security mechanisms for the OS memory. The students will learn basic methods of forensic analysis of storage media and networks. The students will also understand security of the networking infrastructure and its protocols and will be able to design and implement a secured and survivable network. Students will also get an overview of securing data in clouds, database systems, and servers.			
BIE-ADU.1	Unix Administration	Z,ZK	5
BIE-TWA.1	Web Application Design	Z,ZK	5
The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework AngularJS.			
BIE-ADW.1	Windows Administration	Z,ZK	4
Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.			
BIE-XML	XML Technology	Z,ZK	4

Code of the group: BIE-V.2017

Name of the group: Purely Elective Bachelor Courses, Version 2017

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
BIE-3DT.1	3D Printing	KZ	4	3C	L	v
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	v
BIE-ZRS	Basics of Systems Control Kateřina Hyniová Kateřina Hyniová Kateřina Hyniová (Gar.)	Z,ZK	4	2P+2C	L	v

BIE-CZ0	Czech Language for Foreigners <i>Zdeněk Muzikář, Hana Maulová, Petra Korfová, Ivana Vondráčková Miroslav Balík Hana Maulová (Gar.)</i>	KZ	2	4C	Z,L	v
BIE-FTR.1	Financial Markets <i>Pavla Vozárová Pavla Vozárová (Gar.)</i>	Z,ZK	5	2P+2C	L	v
BIE-EHD	Introduction to European Economic History <i>Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)</i>	Z,ZK	3	2P+1C	L	v
BIE-IMA	Introduction to Mathematics <i>Antonella Marchesiello Karel Klouda Antonella Marchesiello (Gar.)</i>	Z	4	3C	Z	v
BIE-IMA2	Introduction to Mathematics 2 <i>Karel Klouda</i>	Z	2	1C	Z	v
BIE-ST1	Network Technology 1 <i>Alexandru Moucha Alexandru Moucha (Gar.)</i>	Z	3	2C	Z	v
BIE-OOP	Object-Oriented Programming <i>Petr Máj, Stéphane Ducasse, Filip Kříkava, Jan Blizničenko Robert Pergl Filip Kříkava (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BIE-PKM	<i>Jitka Rybníčková Jitka Rybníčková (Gar.)</i>	Z	4		Z	v
BIE-PHP.1	Programing in PHP	KZ	4	3C	Z	v
BIE-PJV	Programming in Java <i>Jiří Daněček Miroslav Balík Jiří Daněček (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BIE-PS2	Programming in shell 2 <i>Jan Žďárek, Lukáš Bařinka Lukáš Bařinka Jan Žďárek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-SCE1	Computer Engineering Seminar I <i>Hana Kubátová, Martin Novotný, Miroslav Skrbek Martin Novotný Hana Kubátová (Gar.)</i>	Z	4	2C	L,Z	v

Characteristics of the courses of this group of Study Plan: Code=BIE-V.2017 Name=Purely Elective Bachelor Courses, Version 2017

BIE-OOP	Object-Oriented Programming	Z,ZK	4	Students will learn the pure object-oriented paradigm, being a tool for effective implementation of quality, evolvable business software systems. They will understand fundamentals and they will learn how to apply it for solving typical implementation tasks. Students will learn syntax and programming fundamentals of a pure OO open-source technology Pharo. Various other modern programming languages utilising the OO concepts will be introduced in the subject, as well.
BIE-FTR.1	Financial Markets	Z,ZK	5	Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.
BIE-EHD	Introduction to European Economic History	Z,ZK	3	The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.
BIE-3DT.1	3D Printing	KZ	4	Students learn to design three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects, prepare for printing and print in 3D.
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4	Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.
BIE-ZRS	Basics of Systems Control	Z,ZK	4	Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the field of automatic control will be definitely evaluated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teach you description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in which students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examples and practical industrial implementations.
BIE-CZ0	Czech Language for Foreigners	KZ	2	Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.
BIE-IMA	Introduction to Mathematics	Z	4	Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples.
BIE-IMA2	Introduction to Mathematics 2	Z	2	Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples.
BIE-ST1	Network Technology 1	Z	3	The course is focused on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad curriculum, CCNA1 - R&S Introduction to Networks.
BIE-PKM		Z	4	The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.

BIE-PHP.1	Programing in PHP	KZ	4
Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study.			
BIE-PJV	Programming in Java	Z,ZK	4
The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java language the fundamental APIs will also be presented, especially data structures,files, GUI, net, database and concurrent APIs.			
BIE-PS2	Programming in shell 2	Z,ZK	4
Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: Do not be afraid of this module! We are ready do adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (cut, tr, sort, uniq...) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selection of advanced scripting techniques used in practice.			
BI-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
AE0B16F11	Philosophy I We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.	KZ	4
BI-SCE1	Computer Engineering Seminar I The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.	Z	4
BIE-3DT.1	3D Printing Students learn to design three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects, prepare for printing and print in 3D.	KZ	4
BIE-AAG	Automata and Grammars Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions and regular grammars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between formal languages and automata. Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation, and design of digital circuits.	Z,ZK	6
BIE-ADU.1	Unix Administration	Z,ZK	5
BIE-ADW.1	Windows Administration Students understand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the standard administration and security tools and apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting methods and administrate heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.	Z,ZK	4
BIE-AG1	Algorithms and Graphs 1 The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle practically the asymptotic mathematics.	Z,ZK	6
BIE-AG2	Algorithms and Graphs 2	Z,ZK	5
BIE-APS.1	Architectures of Computer Systems Students understand architectures of uniprocessor computers at the level of machine instructions, with emphasis to instruction pipelining and memory hierarchy. They know the main concepts of RISC and CISC architectures. They learn how modern computers work and how they are constructed. They learn about the techniques that today's processors use to increase the program execution speed. They have a basic knowledge allowing them to optimise their programs to fully exploit a given processor architecture. They get an idea about the trends in the area of computer architectures and how they will affect software. They also understand the architectures of vector processors, their use in today's microprocessors. They understand the principles of shared-memory multiprocessor system architectures and the issues of memory consistency.	Z,ZK	5
BIE-BAP	Bachelor Thesis	Z	14
BIE-BEK	Secure Code The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them.	Z,ZK	5
BIE-BEZ	Security Students understand the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric and asymmetric cryptosystems, and hash functions. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptosystems for computer systems. They are able to properly and securely use cryptographic primitives and systems that are based on these primitives. Students are introduced to legal aspects of information security, security standards, social engineering, and basic principles of security management.	Z,ZK	6
BIE-BIG	DB Technologies for Big Data Students are introduced into the field of Big Data. These are data that the standard relational databases cannot process efficiently due to the size, and at the same time, their real-time processing can provide information that can have key importance for the competitiveness of a company or organization. The course is focused practically. Students learn the most	KZ	4

important professional technologies, such as Apache Cassandra, Apache Hadoop, Apache Solr, and others. The course brings to students theoretical foundation of algorithms used in Big data systems. In the labs, students learn to develop their own applications on top of these technologies.			
BIE-BPR	Bachelor Project	Z	2
At the beginning of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that student will perform during the semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.			
BIE-CAO	Digital and Analog Circuits	Z,ZK	5
Students get the fundamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models and principles of functionality of transistors, gates, circuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the differences between analog and digital modes of electronic devices.			
BIE-CZ0	Czech Language for Foreigners	KZ	2
Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time, Family.			
BIE-DBS	Database Systems	Z,ZK	6
Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level module does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores.			
BIE-DPR	Document., Presentation, Rhetorics	KZ	4
This subject is aimed to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create and prepare interactive presentations and presenting before an audience. Students will also learn to write technical reports and scientific texts. There is no fixed schedule for BIE-DPR. A teacher will contact you before the start of the semester.			
BIE-EFA	Efficient Algorithms	Z,ZK	5
Students get an overview of efficient algorithms and data structures for solving classical algorithmic problems, such as searching and sorting, on dynamically changing data sets. Students are able to design and implement such algorithms, to use methods for analysing their computational and memory complexity. They understand the sorting algorithms with $O(n \log n)$ time complexity, special sorting algorithms with linear complexity, algorithms for associative and address searching. They are able to use the efficient dynamic data structures, such as hash tables, search trees, balanced search trees, heaps, B-trees, and others. They are able to work with recursive algorithms and dynamic programming.			
BIE-EHD	Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global economy through the description of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic history. From large economic area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institutions is deciphered. The course does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and organizations in history. Class meetings will consist of a mixture of lecture and discussion.			
BIE-EMP	Economic and management principles	KZ	4
This course is aimed to fundamental problems of business economy. The course makes students familiar with a life cycle of business, specifically with fields: enterprise foundation, enterprise putting into state economic environment (CR), management of property and capital structure, business transaction records keeping during an accounting period, a relation between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination.			
BIE-EPR	Economic project	Z	1
This course is an extension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will contact you before the start of the semester.			
BIE-FTR.1	Financial Markets	Z,ZK	5
Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.			
BIE-GRA	Graph Algorithms and Complexity Theory	Z,ZK	5
Students get an overview of typical usages of graph models in computing. They learn algorithmic methods of solving graph problems. They understand algorithms for the key application domains of graph theory (flows in networks, heuristic search, approximation of complex problems). Students get basic competence in computer science background: they understand Turing machine models and issues of NP-completeness and NP-hardness.			
BIE-HMI	History of Mathematics and Informatics	Z,ZK	3
Students will master the methods traditionally used in mathematics and related disciplines - informatics - from different periods of the development of mathematics, and will thus become acquainted with mathematical methods suitable for applications in contemporary computer science.			
BIE-HWB	Hardware Security	Z,ZK	5
The course deals with hardware resources used to ensure security of computer systems including embedded ones. The students become familiar with the operating principles of cryptographic modules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of ciphers.			
BIE-IMA	Introduction to Mathematics	Z	4
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples.			
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples.			
BIE-KOM	Conceptual Modelling	Z,ZK	5
The course focuses on the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn the ability to distinguish key concepts in the domain, categorize and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students will learn the basics of ontological structural modeling in OntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Students will also learn the basics of Enterprise Engineering as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn the DEMO methodology. The course is also designed with regard to the continuity of software implementations.			

BIE-LIN	Linear Algebra	Z,ZK	7
Students understand the theoretical foundation of algebra and mathematical principles of linear models of systems around us, where the dependencies among components are only linear. They know the basic methods for operating with polynomials and linear spaces. They are able to perform matrix operations and solve systems of linear equations. They can apply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand error-detecting and error-correcting codes.			
BIE-MIK	Fundamentals of Microeconomics	Z,ZK	4
This is an introductory course of microeconomics designed for students without previous economic background. It describes different market regimes and ways how a firm can react to consumer demand, competitor strategies, government intervention, uncertainty and information asymmetry. All concepts are illustrated on real life examples.			
BIE-MLO	Mathematical Logic	Z,ZK	5
An introduction to propositional and predicate logic.			
BIE-OOP	Object-Oriented Programming	Z,ZK	4
Students will learn the pure object-oriented paradigm, being a tool for effective implementation of quality, evolvable business software systems. They will understand fundamentals and they will learn how to apply it for solving typical implementation tasks. Students will learn syntax and programming fundamentals of a pure OO open-source technology PHP. Various other modern programming languages utilising the OO concepts will be introduced in the subject, as well.			
BIE-OSY	Operating Systems	Z,ZK	5
Students understand the classical theory of operating systems (OS) in addition to the knowledge gained in the BI-PS1 module. They get a solid knowledge of OS kernels, processes and threads implementations. They understand the problems of race conditions and principles and algorithms for critical sections, thread scheduling, resource allocation, deadlocks. They understand the techniques of managing virtual memory, principles and architectures of disks and disk arrays, file systems and peripheral devices. They gain basic knowledge necessary for developing system applications or for system administration. They are able to design and implement simple multithreaded applications.			
BIE-PA1	Programming and Algorithmics 1	Z,ZK	6
Students learn to construct algorithms for solving basic problems and write them in the C language. They understand data types (simple, structured, pointers), expressions, statements, functions, concept of recursion. They learn the basics of algorithm complexity analysis. They know fundamental algorithms for searching, sorting, and manipulating with linked lists.			
BIE-PA2	Programming and Algorithmics 2	Z,ZK	7
Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queue, enlargeable array, set, table). They can implement linked structures. They learn these skills using the programming language C++. Although this is not a module of programming in C++, students are introduced to all C++ features needed to achieve the main objective (e.g., operator overloading, templates).			
BIE-PAI	Law and Informatics	ZK	3
Students have knowledge of fundamental protection of intangible property, overview of contractual aspects of copyright. They are able to design an appropriate contract-based copyright protection and do research and verification of the outputs concerning trademarks, patents, industrial design rights. They are able to participate actively in the proceedings to register intangible property. They have a good overview of the Czech Republic legislation as well as the EU legislation.			
BIE-PHP.1	Programming in PHP	KZ	4
Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study.			
BIE-PJP	Programming Languages and Compilers	Z,ZK	5
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs for parsing and processing text in a language defined by a LL(1) grammar.			
BIE-PJV	Programming in Java	Z,ZK	4
The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java language the fundamental APIs will also be presented, especially data structures, files, GUI, net, database and concurrent APIs.			
BIE-PKM		Z	4
The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.			
BIE-PPA	Programming Paradigms	Z,ZK	5
BIE-PS1	Programming in Shell 1	KZ	5
Students understand the basic principles of operating systems (processes and threads, file systems, access rights, memory management, network interface) with a focus on UNIX like operating systems. In practically oriented exercises, they will learn to use shell, basic commands and filters for processing text data.			
BIE-PS2	Programming in shell 2	Z,ZK	4
Students get a general overview of scripting languages, introduction into syntax, semantics, programming style, pros and cons. In addition, they gain a deeper insight into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Erasmus students: Do not be afraid of this module! We are ready to adapt the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools (cp, ln, mkdir, rm...) and useful basic data filtering tools (cut, tr, sort, uniq...) can be provided. The advantage of this module is that we do not stop at this point - we will show you also a selection of advanced scripting techniques used in practice.			
BIE-PSI	Computer Networks	Z,ZK	5
Students understand the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks focusing primarily the 2nd to 4th layer of the ISO OSI model. They also get a basic understanding of communication media, security, and network administration. Students will be able to write a simple network application and configure a simple network.			
BIE-PST	Probability and Statistics	Z,ZK	5
The students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods of determining the statistical dependence of two or more random variables.			
BIE-SAP	Computer Structures and Architectures	Z,ZK	6
Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools.			
BIE-SI1.2	Software Engineering I	Z,ZK	5
Students learn the methods of analysis and design of large software systems, which are typically designed and implemented in teams. Students will get acquainted with CASE tools using a visual modeling language UML for modeling and solving software-related problems. Students will get an overview of object-oriented analysis, design, architecture, validation, verification, and testing processes. The knowledge obtained in the lectures is practiced on a team project. If enrolled for the BIE-SP1 course running in parallel (only summer semester), the students can work on a single more complex project and they are classified to both courses for a single project. This course does not teach the students programming, nor any particular technology, framework or programming language. The students are required to have some knowledge of these to apply them on their team project.			

BIE-SI2.3	Software Engineering 2	Z,ZK	3
Students will learn to work methodically with respect to software development methodic, especially Unified Process methodic and Unified Modeling Language (UML). They will understand the functions of individual roles in a typical software team, as well as get a practical experience with them in the concurrent BIE-SP2 module. Students will also get an idea about software testing and measuring software quality. This knowledge will get extended with a practical experience thanks to the concurrently running BIE-SP2 module.			
BIE-SP1	Team Software Project 1	KZ	4
In this course, students work on a complex team project applying all the knowledge obtained in the BIE-SI1.2 course. There are no lectures and no seminars/tutorials in this course. This course is to be enrolled in parallel with BIE-SI1.2 course.			
BIE-SP2.2	Team Software Project 2	KZ	4
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BIE-SP1 course project. However, this time, the functionality, testing, and documentation of the system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their solution.			
BIE-SSB	System and Network Security	Z,ZK	5
The students will understand the public key infrastructure (PKI), its strengths and weaknesses, its vulnerabilities against attacks. The students will also understand the analysis of network protocols from the perspectives of: authentication and authorisation, key exchange, and encryption. They get an overview of the security mechanisms of operating systems (OSs), of the ways virtualization can be used to protect OSs, and of the security mechanisms for the OS memory. The students will learn basic methods of forensic analysis of storage media and networks. The students will also understand security of the networking infrastructure and its protocols and will be able to design and implement a secured and survivable network. Students will also get an overview of securing data in clouds, database systems, and servers.			
BIE-ST1	Network Technology 1	Z	3
The course is focused on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netacad curriculum, CCNA1 - R&S Introduction to Networks.			
BIE-TJV	Java Technology	Z,ZK	4
The subject goal is to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programming. This subject presents how to build the three and more layers enterprise systems. The student practically exercises all communication interfaces for each layer (JDBC, RestWeb services, JNDI etc.). At the course end is student able to create three layers enterprise application.			
BIE-TWA.1	Web Application Design	Z,ZK	5
The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework AngularJS.			
BIE-VWM	Searching Web and Multimedia Databases	Z,ZK	5
Students gain basic knowledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogeneous data repository. In particular, the students will understand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they will be aware of similarity retrieval methods focused on heterogeneous multimedia databases (unstructured data collections, respectively).			
BIE-VZD	Data Mining	Z,ZK	4
Students are introduced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multidimensional data visualization, statistical techniques of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic data mining tools to common problems (classification, regression, clustering).			
BIE-XML	XML Technology	Z,ZK	4
BIE-ZDM	Elements of Discrete Mathematics	Z,ZK	5
Students get both a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula approximation, and tools for solving recurrent equations.			
BIE-ZMA	Elements of Calculus	Z,ZK	6
Students acquire knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking and reasoning and are able to use basic proof techniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the links between the integrals and sums of sequences. They are able to estimate lower or upper bounds of values of real functions and to handle simple asymptotic expressions.			
BIE-ZRS	Basics of Systems Control	Z,ZK	4
Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the field of automatic control will be definitely evaluated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teach you description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in which students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examples and practical industrial implementations.			
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.			
FI-HPZ	Humanities subject from a study abroad	Z	3
A "Humanities subject that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module that is required in the curriculum. The substitution is approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.			

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

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