

Study plan

Name of study plan: Electronics and Communications - Radio Systems

Faculty/Institute/Others: Faculty of Electrical Engineering

Department: Department of Electromagnetic Field

Branch of study guaranteed by the department:

Garantor of the study branch:

Program of study: Electronics and Communications

Type of study: Follow-up master full-time

Required credits: 109

Elective courses credits: 11

Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 79

The role of the block: P

Code of the group: 2018_MEKDIP

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_MEKDIP Name=Diploma Thesis

BDIP25	Diploma Thesis	Z	25
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Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.

Code of the group: 2018_MEKP7

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 54 credits

Requirement courses in the group: In this group you have to complete 9 courses

Credits in the group: 54

Note on the group:

Specializace radiové systémy

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
B2M17ANT	Antennas Pavel Hazdra, Hynek Bárčík, Miloš Mazánek, Jan Kraček Pavel Hazdra (Gar.)	Z,ZK	6	2P+2L	L	P
B2M37ART	Architecture of radio receivers and transmitters Josef Dobeš, Pavel Ková Karel Ulovec Pavel Ková (Gar.)	Z,ZK	6	2P+2L	Z	P
B2M32BTSA	Wireless Technologies Zdeněk Bevá, Lukáš Vojtěch, Zbyněk Kocur Lukáš Vojtěch Zdeněk Bevá (Gar.)	Z,ZK	6	2P + 2L	L	P
B2M37DKM	Digital communications Jan Sýkora Jan Sýkora Jan Sýkora (Gar.)	Z,ZK	6	3P+1C	Z	P
B2M37MAM	Microprocessors Petr Skalický, Stanislav Vítek Stanislav Vítek Stanislav Vítek (Gar.)	Z,ZK	6	2P+2L	Z	P
B2M17MIOA	Microwave Circuits Karel Hoffmann, Pěmysl Hudec Pěmysl Hudec Milan Polívka (Gar.)	Z,ZK	6	2P+2C	Z	P
B2M31DSP	Advanced DSP methods Pavel Sovka, Petr Pollák Pavel Sovka Pavel Sovka (Gar.)	Z,ZK	6	2P+2C	Z,L	P

B2MPROJ6	Project <i>Jiří Jakovenko, Pavel Máša, Ivan Pravda, František Rund, Jan Šístek, Lubor Jirásek, Tomáš Zeman, Ladislav Oppl František Rund František Rund (Gar.)</i>	Z	6	Op+6s		P
B2M17SBS	Wave Propagation for Wireless Links <i>Pavel Pecha Pavel Pecha Pavel Pecha (Gar.)</i>	Z,ZK	6	2P+2C	L	P

Characteristics of the courses of this group of Study Plan: Code=2018_MEKP7 Name=Compulsory subjects of the programme

B2M17ANT	Antennas	Z,ZK	6			
Student will get strong knowledge about theory of electromagnetic field radiation and basic principles of antenna design. Methods of analysis are demonstrated on various types of antennas and their arrays. Seminars are both theoretical (analytical and numerical calculation using MATLAB and EM simulators CST) and practical (measurement of antenna parameters).						
B2M37ART	Architecture of radio receivers and transmitters	Z,ZK	6			
The subject deals with the architecture of the radio receivers and transmitters and software radio. The student s familiarize with the design and the modern methods of optimization of the radio receivers and transmitters' functional blocks and with the phenomena related with frequency conversion, noise sources and noise analyses. They learn conceptual radio receiver and transmitter design, including the level and frequency plans and their optimization. The course also deals with the digital signal processing blocks of the modern radio receivers and their practical implementation.						
B2M32BTSA	Wireless Technologies	Z,ZK	6			
The lectures give overview of fundamental principles of wireless networks in various areas of their application. Students will understand architecture, principles and protocols used in different wireless technologies and learn how these technologies can be exploited in real world applications. The goal is to teach students how to solve problems related to deployment of wireless networks, their operation or development of wireless networks components.						
B2M37DKM	Digital communications	Z,ZK	6			
The course provides fundamentals of digital communications theory: modulation, classical coding, channel models, and basic principles of decoding. The exposition is systematically built along the theoretical lines which allow to reveal all inner connections and principles. This allows students to develop the knowledge and use it in an active way in a design and construction of the communication systems. The course provides a necessary fundamental background for subsequent more advanced communications theory courses.						
B2M37MAM	Microprocessors	Z,ZK	6			
The aim is to make students acquainted with the properties of microprocessor systems, make students familiar with on-chip peripherals, connect external circuit to the processor bus, and with implementation of the memory or I/O space address extension. Next, taught the students to make simple program in the assembly language, C language and combination of both. After completion of this subject student should be able to design and implement simpler microprocessor system including connection of necessary peripherals and software design.						
B2M17MIOA	Microwave Circuits	Z,ZK	6			
Subject is focused on the design of planar passive and active microwave circuits.						
B2M31DSP	Advanced DSP methods	Z,ZK	6			
The course follows the basic course in signal processing and introduces advanced methods of analysis and digital signal processing. Graduates will learn the methods of digital signals analysis and be able to practically use them. They learn to know the conditions of use of correlation, spectral and coherent analysis of random signals. They will become familiar with methods of signal decomposition and independent component analysis and the time-frequency transformations. Emphasis will be placed on an ability to interpret the results of signal analyses.						
B2MPROJ6	Project	Z	6			
Independent work in the form of a project. 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 project will be defended within the framework of a subject. Project list http://www.fel.cvut.cz/en/education/semestral-projects.html						
B2M17SBS	Wave Propagation for Wireless Links	Z,ZK	6			
The aim of the course is to study the wireless transmission channel in real environments focusing on wave propagation for planning of terrestrial and satellite wireless links. The syllabus includes both deeper theoretical foundations of radio wave propagation in the atmosphere as well as ITU-R design procedures for terrestrial and satellite, fixed and mobile communications in various frequency bands.						

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 30

The role of the block: PV

Code of the group: 2018_MEKPV7

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 30 credits

Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 30

Note on the group:

Specializace radiové systémy

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
B2M31AEDA	Eperimental Data Analysis <i>Jan Ruzs Jan Ruzs Jan Ruzs (Gar.)</i>	Z,ZK	6	2P+2C	Z	PV
B2M17CADA	CAD in HF Technique <i>Zbyn k Škvor Zbyn k Škvor Zbyn k Škvor (Gar.)</i>	Z,ZK	6	2P+2C	L	PV
B2M37DTRA	Digital Video and Audio Broadcasting <i>Karel Ulovec, Martin Bernas Karel Ulovec Karel Ulovec (Gar.)</i>	Z,ZK	6	2P+2L	Z	PV
B2M37KDKA	Coding in digital communications <i>Jan Sýkora Jan Sýkora Jan Sýkora (Gar.)</i>	Z,ZK	6	3P+1C	L	PV
B2M17MIMA	Microwave Measurements <i>Karel Hoffmann, P emysl Hudec P emysl Hudec P emysl Hudec (Gar.)</i>	Z,ZK	6	2P+2L	L	PV

B2M32MKSA	Mobile Networks <i>Zden k Be vá , Robert Beš ák, Pavel Mach Pavel Mach Zden k Be vá (Gar.)</i>	Z,ZK	6	2P + 2L	Z	PV
B2M34NSV	VLSI System Design <i>Jakub Jirsa, Pavel Hazdra Pavel Hazdra Pavel Hazdra (Gar.)</i>	Z,ZK	6	2P+2L	Z	PV
B2M99RAD	Radar systems <i>Pavel Ková , Pavel Puri er, Tomáš Ko ínek Tomáš Ko ínek Tomáš Ko ínek (Gar.)</i>	Z,ZK	6	2P+2L	Z	PV
B2M37RNVA	Radio Navigation <i>Pavel Ková Pavel Ková Pavel Ková (Gar.)</i>	Z,ZK	6	2P+2L	L	PV

Characteristics of the courses of this group of Study Plan: Code=2018_MEKPV7 Name=Compulsory subjects of the programme

B2M31AEDA	Experimental Data Analysis	Z,ZK	6	In the course of subject "Experimental Data Analysis", students will acquire knowledge regarding fundamental methods for data analysis and machine learning for evaluation and interpretation of data. In the course of practical lectures, students will solve individual tasks using real data from signal processing in neuroscience research. In the course of semestral project, student will solve complex task and present obtained results. The aim of the subject is to introduce practical application of fundamental statistical methods as well as to teach students to use critical thinking and to acquire additional knowledge in solution of practical tasks.		
B2M17CADA	CAD in HF Technique	Z,ZK	6	Introduction into principles and techniques used in modern microwave circuit design.		
B2M37DTRA	Digital Video and Audio Broadcasting	Z,ZK	6	The subject makes students familiar with topics related to video and audio transmission. Described are methods of data stream creation, methods of source and channel coding, error correction principles and modulation formats. Attention is paid to transmission systems standards with regard to transmission channel properties. The subject also deals with multimedia data services and with measurement in transmission systems.		
B2M37KDKA	Coding in digital communications	Z,ZK	6	This course extends and deepens the topics of the basic communication theory courses in the following main areas. 1) Advanced information theory in coding and Network Information Theory develop a framework for understanding the principles of the channel coding in single-user and multi-node/multi-user scenarios. 2) The algebraic coding presents classical topics of block and convolutional codes. 3) Advanced coding technique focuses on turbo, LDPC, Space-Time codes and Wireless Network Coding. 4) Advanced decoding technique, namely iterative and multi-user decoding is a fundamental tool for decoding capacity approaching channel codes.		
B2M17MIMA	Microwave Measurements	Z,ZK	6	Fast development of wireless radio data communications (both mobile and stationary) also results in requirements for measurement of numerous related electrical parameters in frequency band ranging from hundreds of MHz to tens of GHz. The "Microwave measurements" subject brings description of all important measurement instruments and measurement methods used in this field. Instructions devoted to measurement devices also cover detailed inner structures, principles of operation, common measurement setups and optimum setting. Even relatively complex measurement instruments and setups are discussed, for example those used for measurement of noise and non-linear parameters. Exercises are focused on practical measurements commonly performed in the wireless communication field. Besides modern measurement instruments, students also learn a number of typical RF and microwave components, circuits, subsystems and digitally modulated signals.		
B2M32MKSA	Mobile Networks	Z,ZK	6	The lectures introduce principles and functionalities of mobile networks with special focus on currently deployed technologies and future mobile networks. Furthermore, architecture and fundamental principles of GSM, UMTS, LTE and LTE-A will be explained. Then, selected key technologies for future mobile networks (e.g., 5G) will be explained.		
B2M34NSV	VLSI System Design	Z,ZK	6	Introduction to basic building blocks, architecture and design methodologies of advanced VLSI systems. Structure and design of digital and analogue integrated circuit subsystems. Integrated system description and synthesis using cell libraries and IP cores. Synchronization, power consumption and parasitics reduction issues. Testing and reliability of integrated systems. In seminars and labs, the hardware description language VHDL will be explained and used for practical design, synthesis and testing of a system on chip.		
B2M99RAD	Radar systems	Z,ZK	6			
B2M37RNVA	Radio Navigation	Z,ZK	6	The course introduces students to the terrestrial and satellite radio navigation and radar systems. Students get knowledge of the radio navigation systems, and of the structure of navigation and radar signals and methods of their processing. They become familiar with coordinate systems, fundamentals of celestial mechanics, and methods of position estimation. Students get knowledge of practical applications and the integration of navigation systems.		

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_MEKH

Name of the group: Humanities subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
B0M16FIL	Philosophy 2 <i>Peter Zamarovský Peter Zamarovský (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16HVT	History of science and technology 2 <i>Marcela Efmertová Marcela Efmertová Marcela Efmertová (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16HSD1	History of economy and social studies <i>Marcela Efmertová</i>	Z,ZK	5	2P+2S	Z,L	v
B0M16PSM	Psychology <i>Jan Fiala, Josef ernohous Jan Fiala Jan Fiala (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v

B0M16TEO	Theology <i>Vladimír Sláma ka Vladimír Sláma ka Vladimír Sláma ka (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
A003TV	Physical Education	Z	2	0+2	L,Z	v

Characteristics of the courses of this group of Study Plan: Code=2018_MEKH Name=Humanities subjects

B0M16FIL	Philosophy 2 The course is oriented on the transdisciplinary aspects of philosophy, informatics, physics, mathematics and biology.	Z,ZK	5			
B0M16HVT	History of science and technology 2 This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers	Z,ZK	5			
B0M16HSD1	History of economy and social studies This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.	Z,ZK	5			
B0M16PSM	Psychology	Z,ZK	5			
B0M16TEO	Theology This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which grows our civilization up.	Z,ZK	5			
A003TV	Physical Education	Z	2			

Code of the group: MTV

Name of the group: T lesná výchova

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
TVV	Physical education	Z	0	0+2	Z,L	v
TVV0	Physical education	Z	0	0+2	Z,L	v
TV-V1	Physical education	Z	1	0+2	Z,L	v
TVKLV	Physical Education Course	Z	0	7dní	L	v
TVKZV	Physical Education Course	Z	0	7dní	Z	v

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

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

Code of the group: 2018_MEKVOL

Name of the group: Elective subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách
<http://www.fel.cvut.cz/cz/education/volitelne-predmety.html>

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2

B0M16FIL	Philosophy 2 The course is oriented on the transdisciplinary aspects of philosophy, informatics, physics, mathematics and biology.	Z,ZK	5
B0M16HSD1	History of economy and social studies This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.	Z,ZK	5
B0M16HVT	History of science and technology 2 This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers	Z,ZK	5
B0M16PSM	Psychology	Z,ZK	5
B0M16TEO	Theology This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which grows our civilization up.	Z,ZK	5
B2M17ANT	Antennas Student will get strong knowledge about theory of electromagnetic field radiation and basic principles of antenna design. Methods of analysis are demonstrated on various types of antennas and their arrays. Seminars are both theoretical (analytical and numerical calculation using MATLAB and EM simulators CST) and practical (measurement of antenna parameters).	Z,ZK	6
B2M17CADA	CAD in HF Technique Introduction into principles and techniques used in modern microwave circuit design.	Z,ZK	6
B2M17MIMA	Microwave Measurements Fast development of wireless radio data communications (both mobile and stationary) also results in requirements for measurement of numerous related electrical parameters in frequency band ranging from hundreds of MHz to tens of GHz. The "Microwave measurements" subject brings description of all important measurement instruments and measurement methods used in this field. Instructions devoted to measurement devices also cover detailed inner structures, principles of operation, common measurement setups and optimum setting. Even relatively complex measurement instruments and setups are discussed, for example those used for measurement of noise and non-linear parameters. Exercises are focused on practical measurements commonly performed in the wireless communication field. Besides modern measurement instruments, students also learn a number of typical RF and microwave components, circuits, subsystems and digitally modulated signals.	Z,ZK	6
B2M17MIOA	Microwave Circuits Subject is focused on the design of planar passive and active microwave circuits.	Z,ZK	6
B2M17SBS	Wave Propagation for Wireless Links The aim of the course is to study the wireless transmission channel in real environments focusing on wave propagation for planning of terrestrial and satellite wireless links. The syllabus includes both deeper theoretical foundations of radio wave propagation in the atmosphere as well as ITU-R design procedures for terrestrial and satellite, fixed and mobile communications in various frequency bands.	Z,ZK	6
B2M31AEDA	Eperimental Data Analysis In the course of subject "Experimental Data Analysis", students will acquire knowledge regarding fundamental methods for data analysis and machine learning for evaluation and interpretation of data. In the course of practical lectures, students will solve individual tasks using real data from signal processing in neuroscience research. In the course of semestral project, student will solve complex task and present obtained results. The aim of the subject is to introduce practical application of fundamental statistical methods as well as to teach students to use critical thinking and to acquire additional knowledge in solution of practical tasks.	Z,ZK	6
B2M31DSP	Advanced DSP methods The course follows the basic course in signal processing and introduces advanced methods of analysis and digital signal processing. Graduates will learn the methods of digital signals analysis and be able to practically use them. They learn to know the conditions of use of correlation, spectral and coherent analysis of random signals. They will become familiar with methods of signal decomposition and independent component analysis and the time-frequency transformations. Emphasis will be placed on an ability to interpret the results of signal analyses.	Z,ZK	6
B2M32BTSA	Wireless Technologies The lectures give overview of fundamental principles of wireless networks in various areas of their application. Students will understand architecture, principles and protocols used in different wireless technologies and learn how these technologies can be exploited in real world applications. The goal is to teach students how to solve problems related to deployment of wireless networks, their operation or development of wireless networks components.	Z,ZK	6
B2M32MKSA	Mobile Networks The lectures introduce principles and functionalities of mobile networks with special focus on currently deployed technologies and future mobile networks. Furthermore, architecture and fundamental principles of GSM, UMTS, LTE and LTE-A will be explained. Then, selected key technologies for future mobile networks (e.g., 5G) will be explained.	Z,ZK	6
B2M34NSV	VLSI System Design Introduction to basic building blocks, architecture and design methodologies of advanced VLSI systems. Structure and design of digital and analogue integrated circuit subsystems. Integrated system description and synthesis using cell libraries and IP cores. Synchronization, power consumption and parasitics reduction issues. Testing and reliability of integrated systems. In seminars and labs, the hardware description language VHDL will be explained and used for practical design, synthesis and testing of a system on chip.	Z,ZK	6
B2M37ART	Architecture of radio receivers and transmitters The subject deals with the architecture of the radio receivers and transmitters and software radio. The student s familiarize with the design and the modern methods of optimization of the radio receivers and transmitters' functional blocks and with the phenomena related with frequency conversion, noise sources and noise analyses. They learn conceptual radio receiver and transmitter design, including the level and frequency plans and their optimization. The course also deals with the digital signal processing blocks of the modern radio receivers and their practical implementation.	Z,ZK	6
B2M37DKM	Digital communications The course provides fundamentals of digital communications theory: modulation, classical coding, channel models, and basic principles of decoding. The exposition is systematically built along the theoretical lines which allow to reveal all inner connections and principles. This allows students to develop the knowledge and use it in an active way in a design and construction of the communication systems. The course provides a necessary fundamental background for subsequent more advanced communications theory courses.	Z,ZK	6
B2M37DTRA	Digital Video and Audio Broadcasting This subject makes students familiar with topics related to video and audio transmission. Described are methods of data stream creation, methods of source and channel coding, error correction principles and modulation formats. Attention is paid to transmission systems standards with regard to transmission channel properties. The subject also deals with multimedia data services and with measurement in transmission systems.	Z,ZK	6
B2M37KDKA	Coding in digital communications This course extends and deepens the topics of the basic communication theory courses in the following main areas. 1) Advanced information theory in coding and Network Information Theory develop a framework for understanding the principles of the channel coding in single-user and multi-node/multi-user scenarios. 2) The algebraic coding presents classical topics of block and convolutional codes. 3) Advanced coding technique focuses on turbo, LDPC, Space-Time codes and Wireless Network Coding. 4) Advanced decoding technique, namely iterative and multi-user decoding is a fundamental tool for decoding capacity approaching channel codes.	Z,ZK	6

B2M37MAM	Microprocessors	Z,ZK	6
The aim is to make students acquainted with the properties of microprocessor systems, make students familiar with on-chip peripherals, connect external circuit to the processor bus, and with implementation of the memory or I/O space address extension. Next, taught the students to make simple program in the assembly language, C language and combination of both. After completion of this subject student should be able to design and implement simpler microprocessor system including connection of necessary peripherals and software design.			
B2M37RNVA	Radio Navigation	Z,ZK	6
The course introduces students to the terrestrial and satellite radio navigation and radar systems. Students get knowledge of the radio navigation systems, and of the structure of navigation and radar signals and methods of their processing. They become familiar with coordinate systems, fundamentals of celestial mechanics, and methods of position estimation. Students get knowledge of practical applications and the integration of navigation systems.			
B2M99RAD	Radar systems	Z,ZK	6
B2MPROJ6	Project	Z	6
Independent work in the form of a project. 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 project will be defended within the framework of a subject. Project list http://www.fel.cvut.cz/en/education/semestral-projects.html			
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.			
TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

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

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