Study plan

Name of study plan: Electronics and Communications - Technology of the Internet of Things

Faculty/Institute/Others: Faculty of Electrical Engineering
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: 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_MEKEP4
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 technologie internetu věcí

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
BE2M32PST	**Advanced Networking Technologies** *Leoš Boháč **Leoš Boháč** Leoš Boháč (Gar.)*	Z,ZK	6	2P + 2L	Z,L	P
BE2M31DSPA	**Digital Signal Processing** *Petr Pollák **Petr Pollák** Petr Pollák (Gar.)*	Z,ZK	6	2P+2C	Z	P
BE2M34SIS	**Integrated System Structures** *Jiří Jakovenko, Vladimír Janíček **Jiří Jakovenko** Jiří Jakovenko (Gar.)*	Z,ZK	6	2P+2C	Z	P
BE2M37MAM	**Microprocessors** *Stanislav Vítek **Stanislav Vítek** Stanislav Vítek (Gar.)*	Z,ZK	6	2P+2L	Z	P
BE2M34MST	**Microsystems** *Miroslav Husák, Alexandr Laposa, Adam Bouřa **Miroslav Husák** Miroslav Husák (Gar.)*	Z,ZK	6	2P+2L	L	P
BE2M32MKSA	**Mobile Networks** *Robert Bešťák, Zdeněk Bečvář, Pavel Mach **Pavel Mach** Zdeněk Bečvář (Gar.)*	Z,ZK	6	2P + 2L	Z	P
BE2MPROJ6	**Project** *Zdeněk Bečvář, Jan Šístek, Pavel Máša, Ivan Pravda, Lubor Jirásek, František Rund **František Rund** František Rund (Gar.)*	Z	6	0p+6s		P
BE2M17SBS	**Wave Propagation for Wireless Links** *Pavel Pechač **Pavel Pechač** Pavel Pechač (Gar.)*	Z,ZK	6	2P+2C	L	P
BE2M32BTSA	**Wireless Technologies** *Zdeněk Bečvář, Pavel Mach, Lukáš Vojtěch, Zbyněk Kocur **Ján Kučerák** Zdeněk Bečvář (Gar.)*	Z,ZK	6	2P + 2L	Z,L	P

Characteristics of the courses of this group of Study Plan: Code=2018_MEKEP4 Name=Compulsory subjects of the programme

BE2M32PST	Advanced Networking Technologies	Z,ZK	6

The "Advanced Network Technologies" course is designed to expand students' insights into modern network technologies and deepen their understanding of advanced networking protocols within data networks. Students will engage in practical exercises involving Internet unicast routing, multicast routing, IPv6, and MPLS network design, using network simulation tools such as PacketTracer and EveNG. Given the course's emphasis on remote lab activities, instruction will predominantly be delivered online.

BE2M31DSPA	Digital Signal Processing	Z,ZK	6

The subject gives overview about basic methods of digital signal processing and their applications (examples from speech and biological signal processing): disrete-time signals and systems, signal characteristics in time and frequency domain, Fourier transform, fast algorithms for DFT computation, introduction to digital filter design, digital filtering in time and frequency domain, decimation and interpolation and their usage in filter banks, basics of LPC analysis. Further details can be found at http://noel.feld.cvut.cz/vyu/be2m31dspa .

BE2M34SIS	Integrated System Structures	Z,ZK	6
Student learn main design methodologies of analog, digital and optoelectronic integrated systems; Detailed description of the technological process for the IC production; CMOS technologies and its advanced sub-micron trends; IC chip topology, layout and design rules; Technology of micro-electro-mechanical systems MEMS.			
BE2M37MAM	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.			
BE2M34MST	Microsystems	Z,ZK	6
The course deals with system integration applied in the design of digital and analog systems. It demonstrates the new possibilities of implementation and application of integrated microelectronic devices based on various physical and biochemical principles. It presents primarily MEMS technology that increases reliability with all its attributes. The course presents the modern action elements and microactuators, whose operation is based on fundamental physical and biochemical principles, including basic applications in micromanipulation, microrobots, microdrives, microsurgery, multimedia, medical, industrial control, automotive, etc. In the course are presented the principles of touch screens, microgenerators of electrical energy. There are mentioned basic elements of the use of nanotechnology and nanoelectronic structures and basic microsystem technologies.			
BE2M32MKSA	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/LTE-A, and 5G will be explained. Then, selected key technologies for future mobile networks (6G) will be explained.			
BE2MPROJ6	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. List of possible topics: http://www.fel.cvut.cz/en/education/semestral-projects.html			
BE2M17SBS	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.			
BE2M32BTSA	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.			

Code of the group: 2018_MEKEDIP
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_MEKEDIP Name=Diploma Thesis

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

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_MEKEPV4
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 technologie internetu věcí

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
BE2M17ANT	**Antennas** *Pavel Hazdra, Miloš Mazánek, Jan Kraček **Jan Kraček** Miloš Mazánek (Gar.)*	Z,ZK	6	2P+2L	L	PV
BE2M37ART	**Architecture of Radio Receivers and Transmitters** *Josef Dobeš, Pavel Kovář **Karel Ulovec** Pavel Kovář (Gar.)*	Z,ZK	6	2P+2L	Z	PV
BE2M37KDKA	**Coding in Digital Communications** *Jan Sýkora **Jan Sýkora** Jan Sýkora (Gar.)*	Z,ZK	6	3P+1C	L	PV

BE2M34ZETA	**Custom Electronics Design** *Vladimír Janíček* ***Vladimír Janíček*** *Vladimír Janíček (Gar.)*	KZ	6	2P+2L	Z	PV
BE2M34NIS	**Design of Integrated Circuits** *Vladimír Janíček* ***Vladimír Janíček*** *Jiří Jakovenko (Gar.)*	Z,ZK	6	2P+2C	L	PV
BE2M37DKM	**Digital Communications** *Pavel Puričer, Jan Sýkora* ***Pavel Puričer*** *Jan Sýkora (Gar.)*	Z,ZK	6	3P+1C	Z	PV
BE2M37OBFA	**Image Photonics** *Petr Páta, Lukáš Krauz* ***Jan Bednář*** *Petr Páta (Gar.)*	Z,ZK	6	2P+2L	Z	PV
BE2M32IBEA	**Information Security** *Tomáš Vaněk, Peter Macejko* ***Petr Hampl*** *Robert Bešťák (Gar.)*	Z,ZK	6	2P + 2C	L	PV
BE2M32DSAA	**Network Application Diagnostics** *Radek Mařík* ***Radek Mařík*** *Radek Mařík (Gar.)*	Z,ZK	6	2P + 2C	Z	PV
BE2M34NSV	**VLSI System Design** *Pavel Hazdra* ***Pavel Hazdra*** *Pavel Hazdra (Gar.)*	Z,ZK	6	2P+2L	Z	PV

Characteristics of the courses of this group of Study Plan: Code=2018_MEKEPV4 Name=Compulsory subjects of the programme

BE2M17ANT	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).

BE2M37ART	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.

BE2M37KDKA	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.

BE2M34ZETA	Custom Electronics Design	KZ	6

The course deals with the design methodology of advanced custom electronics. The aim is to convert theoretical knowledge of previous studies into specific proposals for practical applications. Student are getting familiar with the problems encountered in the professional electronic design and manufacturing. This course is based on real experience in development and production, showing the latest technological trends and component base.

BE2M34NIS	Design of Integrated Circuits	Z,ZK	6

Main tasks of integrated circuits designer; design abstraction levels - Y chart. Definitions of specification, feasibility study, criteria for technology and design kits selection. Integrated systems design and simulation methodologies. Main features of full custom design, gate array, standard cells, programmable array logic. Design aspects of RF and mobile low power systems. Verilog-A, Verilog-AMS, VHDL-A. Logic and physical synthesis. Frond End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenches design and verification.

BE2M37DKM	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.

BE2M37OBFA	Image Photonics	Z,ZK	6

The subject offers a detailed overview of applied imaging photonic elements and systems. The subject deals with fundamentals of optics, Fourier optics and optical computing. Fourier optics. Image sensors - tube, CCD, CMOS. Image displays. Image converters and amplifiers. Photography and holography - sensitometry and densitometry. Photonic (optical) computing. Electron optics. Image processing in biosystems. Image processing for photonics.

BE2M32IBEA	Information Security	Z,ZK	6

The Information Security course provides a complete source of information on the field of security of information systems and information technologies. The most of information in today's world is created, transferred, stored in electronic form so information security is very important part of it. On successful completion of this course, students should be able to define the cryptographic primitives symmetric / asymmetric encryption, digital signatures, cryptographic hash function, and message authentication codes. They should be able to explain the security features offered by the latest versions of the most important security protocols operating on the TCP/IP stack (IPsec, TLS, SSH, PGP) and describe known attacks against these security protocols.

BE2M32DSAA	Network Application Diagnostics	Z,ZK	6

The first part of the course deals with complex network structures, their characteristics identification, with recognition of both structural static and dynamic patterns, and anomaly detection. The second part of the course is focused on specification methods of static and dynamic behavior and their verification. The use of the methods is demonstrated on examples dealing with network application issues. The special treatment is dedicated not only to network and cloud applications, but also to possibilities of diagnostic process automation. The students gain sufficient skills in seminars where they solve practical problems in digital network domain.

BE2M34NSV	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.

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_MEKEVOL
Name of the group: Elective subjects
Requirement credits in the group:
Requirement courses in the group:

Credits in the group: 0

Note on the group: ~Student can choose arbitrary subject of themagister's program (EEM - Electrical Engineering, Power Engineering and Management, EK - Electronics and Communications, KYR - Cybernetics and Robotics, OI - Open Informatics, OES - Open Electronics Systems) which is not part of his curriculum. Student can choose with consideration of recommendation of the branch guarantee.You can find a selection of optional courses organized by the departments on the web site http://www.fel.cvut.cz/cz/education/volitelne-predmety.html

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Code of the group: 2018_MEKEH

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)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
AE0M32KMP	**Communications and Media Law**	Z,ZK	4	2P + 2C	Z,L	v
BE0M16HSD	**History of economy and social studies** *Marcela Efmertová* ***Marcela Efmertová*** *Marcela Efmertová (Gar.)*	Z,ZK	4	2P+2S	Z,L	v
BE0M16HT2	**History of science and technology 2** ***Marcela Efmertová***	Z,ZK	4	2P+2S	L	v
BE0M16FI2	**Philosophy II**	Z,ZK	4	2P+2S	L	v
BE0M16MPS	**Psychology**	Z,ZK	4	2P+2S	L	v
BE0M16TE1	**Theology**	Z,ZK	4	2P+2S	L	v

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

AE0M32KMP	Communications and Media Law	Z,ZK	4
A complex course dedicated to interdisciplinary problems - the legal aspects of electronic communications (information and communications systems), as well as media from the viewpoint of European and national law. It analyses the areas of informatics, electronic communications, information society services, copyright and general intellectual property rights, the protection of identity, introduction to software law and the Internet as a global communication and information system.			
BE0M16HSD	History of economy and social studies	Z,ZK	4
This subject deals with the history of the European and Czech society in the 19th - 21th centuries. It follows the forming of the European and Czech political representation, its aims and achieved results as well as the social, economical, technical and cultural development and coexistence of the various ethnical groups.			
BE0M16HT2	History of science and technology 2	Z,ZK	4
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			
BE0M16FI2	Philosophy II	Z,ZK	4
The course is oriented on the transdisciplinar aspects of philosophy, informatics, physics, mathematics and biology.			
BE0M16MPS	Psychology	Z,ZK	4
BE0M16TE1	Theology	Z,ZK	4
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 graws our civilization up.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
AE0M32KMP	Communications and Media Law	Z,ZK	4
A complex course dedicated to interdisciplinary problems - the legal aspects of electronic communications (information and communications systems), as well as media from the viewpoint of European and national law. It analyses the areas of informatics, electronic communications, information society services, copyright and general intellectual property rights, the protection of identity, introduction to software law and the Internet as a global communication and information system.			
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.			
BE0M16FI2	Philosophy II	Z,ZK	4
The course is oriented on the transdisciplinar aspects of philosophy, informatics, physics, mathematics and biology.			

BE0M16HSD	History of economy and social studies	Z,ZK	4
This subject deals with the history of the European and Czech society in the 19th - 21th centuries. It follows the forming of the European and Czech political representation, its aims and achieved results as well as the social, economical, technical and cultural development and coexistence of the various ethnical groups.			
BE0M16HT2	History of science and technology 2	Z,ZK	4
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			
BE0M16MPS	Psychology	Z,ZK	4
BE0M16TE1	Theology	Z,ZK	4
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 graws our civilization up.			
BE2M17ANT	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).			
BE2M17SBS	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.			
BE2M31DSPA	Digital Signal Processing	Z,ZK	6
The subject gives overview about basic methods of digital signal processing and their applications (examples from speech and biological signal processing): disrete-time signals and systems, signal characteristics in time and frequency domain, Fourier transform, fast algorithms for DFT computation, introduction to digital filter design, digital filtering in time and frequency domain, decimation and interpolation and their usage in filter banks, basics of LPC analysis. Further details can be found at http://noel.feld.cvut.cz/vyu/be2m31dspa .			
BE2M32BTSA	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.			
BE2M32DSAA	Network Application Diagnostics	Z,ZK	6
The first part of the course deals with complex network structures, their characteristics identification, with recognition of both structural static and dynamic patterns, and anomaly detection. The second part of the course is focused on specification methods of static and dynamic behavior and their verification. The use of the methods is demonstrated on examples dealing with network application issues. The special treatment is dedicated not only to network and cloud applications, but also to possibilities of diagnostic process automation. The students gain sufficient skills in seminars where they solve practical problems in digital network domain.			
BE2M32IBEA	Information Security	Z,ZK	6
The Information Security course provides a complete source of information on the field of security of information systems and information technologies. The most of information in today's world is created, transferred, stored in electronic form so information security is very important part of it. On successful completion of this course, students should be able to define the cryptographic primitives symmetric / asymmetric encryption, digital signatures, cryptographic hash function, and message authentication codes. They should be able to explain the security features offered by the latest versions of the most important security protocols operating on the TCP/IP stack (IPsec, TLS, SSH, PGP) and describe known attacks against these security protocols.			
BE2M32MKSA	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/LTE-A, and 5G will be explained. Then, selected key technologies for future mobile networks (6G) will be explained.			
BE2M32PST	Advanced Networking Technologies	Z,ZK	6
The "Advanced Network Technologies" course is designed to expand students' insights into modern network technologies and deepen their understanding of advanced networking protocols within data networks. Students will engage in practical exercises involving Internet unicast routing, multicast routing, IPv6, and MPLS network design, using network simulation tools such as PacketTracer and EveNG. Given the course's emphasis on remote lab activities, instruction will predominantly be delivered online.			
BE2M34MST	Microsystems	Z,ZK	6
The course deals with system integration applied in the design of digital and analog systems. It demonstrates the new possibilities of implementation and application of integrated microelectronic devices based on various physical and biochemical principles. It presents primarily MEMS technology that increases reliability with all its attributes. The course presents the modern action elements and microactuators, whose operation is based on fundamental physical and biochemical principles, including basic applications in micromanipulation, microrobots, microdrives, microsurgery, multimedia, medical, industrial control, automotive, etc. In the course are presented the principles of touch screens, microgenerators of electrical energy. There are mentioned basic elements of the use of nanotechnology and nanoelectronic structures and basic microsystem technologies.			
BE2M34NIS	Design of Integrated Circuits	Z,ZK	6
Main tasks of integrated circuits designer; design abstraction levels - Y chart. Definitions of specification, feasibility study, criteria for technology and design kits selection. Integrated systems design and simulation methodologies. Main features of full custom design, gate array, standard cells, programmable array logic. Design aspects of RF and mobile low power systems. Verilog-A, Verilog-AMS, VHDL-A. Logic and physical synthesis. Frond End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenches design and verification.			
BE2M34NSV	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.			
BE2M34SIS	Integrated System Structures	Z,ZK	6
Student learn main design methodologies of analog, digital and optoelectronic integrated systems; Detailed description of the technological process for the IC production; CMOS technologies and its advanced sub-micron trends; IC chip topology, layout and design rules; Technology of micro-electro-mechanical systems MEMS.			
BE2M34ZETA	Custom Electronics Design	KZ	6
The course deals with the design methodology of advanced custom electronics. The aim is to convert theoretical knowledge of previous studies into specific proposals for practical applications. Student are getting familiar with the problems encountered in the professional electronic design and manufacturing. This course is based on real experience in development and production, showing the latest technological trends and component base.			
BE2M37ART	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.		
BE2M37DKM	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.		
BE2M37KDKA	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.		
BE2M37MAM	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.		
BE2M37OBFA	Image Photonics	Z,ZK	6
	The subject offers a detailed overview of applied imaging photonic elements and systems. The subject deals with fundamentals of optics, Fourier optics and optical computing. Fourier optics. Image sensors - tube, CCD, CMOS. Image displays. Image converters and amplifiers. Photography and holography - sensitometry and densitometry. Photonic (optical) computing. Electron optics. Image processing in biosystems. Image processing for photonics.		
BE2MPROJ6	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. List of possible topics: http://www.fel.cvut.cz/en/education/semestral-projects.html		

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