Study plan

Name of study plan: Electronics and Communications - Photonics

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_MEKEP3
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 fotonika

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
BE2M31DSPA	**Digital Signal Processing** *Petr Pollák **Petr Pollák** Petr Pollák (Gar.)*	Z,ZK	6	2P+2C	Z	P
BE2M17VOT	**Fiber Optic Technology** *Matěj Komanec, Stanislav Zvánovec, Jan Šístek **Stanislav Zvánovec** Stanislav Zvánovec (Gar.)*	Z,ZK	6	2P+2L	Z	P
BE2M37OBFA	**Image Photonics** *Petr Páta, Lukáš Krauz **Jan Bednář** Petr Páta (Gar.)*	Z,ZK	6	2P+2L	Z	P
BE2M37OBT	**Image Technology** *Petr Páta, Lukáš Krauz, Miloš Klíma, Karel Fliegel **Karel Fliegel** Petr Páta (Gar.)*	Z,ZK	6	2P+2L	Z	P
BE2M37MAM	**Microprocessors** *Stanislav Vítek **Stanislav Vítek** Stanislav Vítek (Gar.)*	Z,ZK	6	2P+2L	Z	P
BE2M32OSS	**Optical Systems and Networks** *Michal Lucki **Michal Lucki***	Z,ZK	6	2P + 2L	L	P
BE2MPROJ6	**Project** *Jan Šístek, Pavel Máša, Ivan Pravda, Lubor Jirásek, Zdeněk Bečvář, 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, Lukáš Vojtěch, Zbyněk Kocur, Pavel Mach **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_MEKEP3 Name=Compulsory subjects of the programme

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 .

BE2M17VOT	Fiber Optic Technology	Z,ZK	6

The aim of the course is to introduce mechanisms of propagation of optical waves in optical fibers and fiber components. Furthermore, the optical measuring techniques and measuring methods for the characterization of optical fibers will be presented. Lectures include both the design and methodology of measuring transmission parameters for optical communication systems such as numerical aperture, attenuation, dispersion, and measurement of basic characteristics of active and passive elements of optical communication systems - connectors, splices, couplers, refractive indices etc.

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.

BE2M37OBT	Image Technology	Z,ZK	6

This course deals with multimedia technology and it is focused mainly on acquisition, processing and reproduction of image information. It covers area of measurements in photometry, radiometry and colorimetry; design of objective lenses, image sensors and displays including their parameters. Further the course deals with cinematography, photography and with other special methods of image reproduction, e.g. polygraphy and digital printing techniques. Studied problems are completed with explanation of advanced methods of image processing (preprocessing, compression, image reconstruction, etc.).

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.

BE2M32OSS	Optical Systems and Networks	Z,ZK	6

The course deals with the use of optical radiation for the transmission of information. The aim is to acquaint students with the functions of important components used in an advanced optical communication systems and networks. Students will learn how to design practical optical fiber link and the network. Students will receive theoretical knowledge for the implementation of a all-optical photonic networks in the future, which will be based on a combination of wavelength multiplex with an all-optical switching.

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_MEKEPV3
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 fotonika

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
BE2M37MOTA	**Advanced areas in image and video technology** ***Karel Fliegel***	Z,ZK	6	2P+2L	Z	PV
BE2M17CADA	**CAD in HF Technique** *Zbyněk Škvor* ***Zbyněk Škvor*** *Zbyněk Škvor (Gar.)*	Z,ZK	6	2P+2C	L	PV

BE2M34ZETA	**Custom Electronics Design** *Vladimír Janíček* ***Vladimír Janíček*** *Vladimír Janíček (Gar.)*	KZ	6	2P+2L	Z	PV
BE2M17MIOA	**Microwave Circuits** *Přemysl Hudec, Karel Hoffmann* ***Přemysl Hudec*** *Milan Polívka (Gar.)*	Z,ZK	6	2P+2C	Z	PV
BE2M34NANA	**Nanoelectronics and Nanotechnology** *Jan Voves* ***Jan Voves*** *Jan Voves (Gar.)*	Z,ZK	6	2P+2C	L	PV
BE2M17OPM	**Optical Measurements** *Matěj Komanec, Stanislav Zvánovec, Stanislav Vítek* ***Matěj Komanec*** *Stanislav Zvánovec (Gar.)*	Z,ZK	6	2P+2L	L	PV
BE2M34PIOA	**Planar Integrated Optics** *Vítězslav Jeřábek, Václav Prajzler* ***Václav Prajzler*** *Václav Prajzler (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_MEKEPV3 Name=Compulsory subjects of the programme

BE2M37MOTA	Advanced areas in image and video technology	Z,ZK	6

This course focuses on the state-of-the-art techniques for digital image and video technology. These techniques and their applications cover almost all areas of technical professions dealing with human interaction. A significant part of the course is focused on the methods of image signal processing and main hardware and software functional blocks of related imaging systems. The aim of the laboratory exercises is to familiarize with advanced methods for capturing, processing and reproduction of image information. Due to the fast progress in this area, the content of the lectures and exercises is being continuously updated.

BE2M17CADA	CAD in HF Technique	Z,ZK	6

Introduction into principles and techniques used in modern microwave circuit design.

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.

BE2M17MIOA	Microwave Circuits	Z,ZK	6

Subject is focused on the design of planar passive and active microwave circuits.

BE2M34NANA	Nanoelectronics and Nanotechnology	Z,ZK	6

The subject is oriented on the present nanotechnologies in the connection with their electronic, photonic and spintrinic applications. Quantum theory basics are used to explain the effects observed in nanostructures. Basic nanoelectronic structures are described with their possible applications. Modern computer methods and models, which are able to simulate the operation of nanoelectronic structures and which are the important tools for their design and optimalisation, are studied.

BE2M17OPM	Optical Measurements	Z,ZK	6
BE2M34PIOA	Planar Integrated Optics	Z,ZK	6

The subject describes theoretical and technological principles and design of planar integrated optics and optoelectronics as optical dividers, The students get acquainted with the principles of the light propagation in planar waveguide and with basic devices and structures of integrated optics and optoelectronics as coupling elements, optical microresonators, planar optical transmitters an receivers with SS-LD, WG-PD . In the course are integrated devices and structures for telecommunication for multiplexing and signal processing. There are optical elements for physical and chemical sensor application and basic important measurement and diagnostic methods.

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

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.			
BE2M17CADA	CAD in HF Technique	Z,ZK	6
Introduction into principles and techniques used in modern microwave circuit design.			
BE2M17MIOA	Microwave Circuits	Z,ZK	6
Subject is focused on the design of planar passive and active microwave circuits.			
BE2M17OPM	Optical Measurements	Z,ZK	6

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.			
BE2M17VOT	Fiber Optic Technology	Z,ZK	6
The aim of the course is to introduce mechanisms of propagation of optical waves in optical fibers and fiber components. Furthermore, the optical measuring techniques and measuring methods for the characterization of optical fibers will be presented. Lectures include both the design and methodology of measuring transmission parameters for optical communication systems such as numerical aperture, attenuation, dispersion, and measurement of basic characteristics of active and passive elements of optical communication systems - connectors, splices, couplers, refractive indices etc.			
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.			
BE2M32OSS	Optical Systems and Networks	Z,ZK	6
The course deals with the use of optical radiation for the transmission of information. The aim is to acquaint students with the functions of important components used in an advanced optical communication systems and networks. Students will learn how to design practical optical fiber link and the network. Students will receive theoretical knowledge for the implementation of a all-optical photonic networks in the future, which will be based on a combination of wavelength multiplex with an all-optical switching.			
BE2M34NANA	Nanoelectronics and Nanotechnology	Z,ZK	6
The subject is oriented on the present nanotechnologies in the connection with their electronic, photonic and spintrinic applications. Quantum theory basics are used to explain the effects observed in nanostructures. Basic nanoelectronic structures are described with their possible applications. Modern computer methods and models, which are able to simulate the operation of nanoelectronic structures and which are the important tools for their design and optimalisation, are studied.			
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.			
BE2M34PIOA	Planar Integrated Optics	Z,ZK	6
The subject describes theoretical and technological principles and design of planar integrated optics and optoelectronics as optical dividers, The students get acquainted with the principles of the light propagation in planar waveguide and with basic devices and structures of integrated optics and optoelectronics as coupling elements, optical microresonators, planar optical transmitters an receivers with SS-LD, WG-PD . In the course are integrated devices and structures for telecommunication for multiplexing and signal processing. There are optical elements for physical and chemical sensor application and basic important measurement and diagnostic methods.			
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.			
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.			
BE2M37MOTA	Advanced areas in image and video technology	Z,ZK	6
This course focuses on the state-of-the-art techniques for digital image and video technology. These techniques and their applications cover almost all areas of technical professions dealing with human interaction. A significant part of the course is focused on the methods of image signal processing and main hardware and software functional blocks of related imaging systems. The aim of the laboratory exercises is to familiarize with advanced methods for capturing, processing and reproduction of image information. Due to the fast progress in this area, the content of the lectures and exercises is being continuously updated.			
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.			
BE2M37OBT	Image Technology	Z,ZK	6
This course deals with multimedia technology and it is focused mainly on acquisition, processing and reproduction of image information. It covers area of measurements in photometry, radiometry and colorimetry; design of objective lenses, image sensors and displays including their parameters. Further the course deals with cinematography, photography and with other special methods of image reproduction, e.g. polygraphy and digital printing techniques. Studied problems are completed with explanation of advanced methods of image processing (preprocessing, compression, image reconstruction, etc.).			
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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