

# Study plan

## Name of study plan: Electronics and Communications - Mobile Communications

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\_MEKEP6

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 mobilní komunikace

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	<b>Advanced Networking Technologies</b> Leoš Bohá Zbyn k Kocur Leoš Bohá (Gar.)	Z,ZK	6	2P + 2L	Z,L	P
BE2M17ANT	<b>Antennas</b> Pavel Hazdra, Miloš Mazánek, Jan Kra ek Jan Kra ek Miloš Mazánek (Gar.)	Z,ZK	6	2P+2L	L	P
BE2M37DKM	<b>Digital Communications</b> Jan Sýkora, Pavel Puri er Pavel Puri er Jan Sýkora (Gar.)	Z,ZK	6	3P+1C	Z	P
BE2M31DSPA	<b>Digital Signal Processing</b> Petr Pollák Petr Pollák Petr Pollák (Gar.)	Z,ZK	6	2P+2C	Z	P
BE2M37MAM	<b>Microprocessors</b> Stanislav Vítek Stanislav Vítek Stanislav Vítek (Gar.)	Z,ZK	6	2P+2L	Z	P
BE2M32MKSA	<b>Mobile Networks</b> Robert Bešák, Zden k Be vá , Pavel Mach Pavel Mach Zden k Be vá (Gar.)	Z,ZK	6	2P + 2L	Z	P
BE2MPROJ6	<b>Project</b> Zden k Be vá , Jan Šístek, Pavel Máša, Ivan Pravda, Lubor Jirásek, František Rund František Rund František Rund (Gar.)	Z	6	0p+6s		P
BE2M17SBS	<b>Wave Propagation for Wireless Links</b> Miloš Mazánek, Jan Kra ek, Pavel Pecha Jan Kra ek Pavel Pecha (Gar.)	Z,ZK	6	2P+2C	L	P
BE2M32BTSA	<b>Wireless Technologies</b> Zbyn k Kocur, Zden k Be vá , Pavel Mach, Lukáš Vojt ch Ján Ku erák Zden k Be vá (Gar.)	Z,ZK	6	2P + 2L	Z,L	P

### Characteristics of the courses of this group of Study Plan: Code=2018\_MEKEP6 Name=Compulsory subjects of the programme

BE2M32PST	Advanced Networking Technologies	Z,ZK	6
Subject Advanced Network Technologies extends student knowledge in an area of modern network technologies. The course strives to deepen student's knowledge in more advanced technical features of contemporary networking protocols in data networks. Students will get hands-on experience with topics like Internet unicast routing, multicast routing, IPv6 and design of MPLS networks using various network simulation tools.			
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).			
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.			

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): discrete-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 <a href="http://noel.feld.cvut.cz/vyu/be2m31dspa&amp;gt;http://noel.feld.cvut.cz/vyu/be2m31dspa&amp;lt;/a&amp;gt;">http://noel.feld.cvut.cz/vyu/be2m31dspa&amp;gt;http://noel.feld.cvut.cz/vyu/be2m31dspa&amp;lt;/a&amp;gt;</a> .			
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.			
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: <a href="http://www.fel.cvut.cz/en/education/semestral-projects.html">http://www.fel.cvut.cz/en/education/semestral-projects.html</a>			
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\_MEKEPV6

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 mobilní komunikace

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
BE2M37ART	Architecture of Radio Receivers and Transmitters Josef Dobeš, Pavel Ková Karel Ulovec Pavel Ková (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
BE2M32DZSA	Digital Signal Processing in Telecommunication Pavel Bezpalec	Z,ZK	6	2P + 2L	Z	PV
BE2M32DSVA	Distributed Computing Peter Macejko Peter Macejko Peter Macejko (Gar.)	Z,ZK	6	2P + 2C	Z	PV
BE2M32IBEA	Information Security Peter Macejko, Tomáš Van k Petr Hampel Robert Bešák (Gar.)	Z,ZK	6	2P + 2C	L	PV

BE2M32THOA	<b>Queueing Theory</b> <i>Petr Hampl Petr Hampl Petr Hampl (Gar.)</i>	Z,ZK	6	3P + 1L	Z	PV
BE2M32RTK	<b>Telephony Communication Control</b> <i>Robert Bešák, Ján Ku erák, Pavel Troller Ján Ku erák Robert Bešák (Gar.)</i>	Z,ZK	6	2P + 2L	L	PV

**Characteristics of the courses of this group of Study Plan: Code=2018\_MEKEPV6 Name=Compulsory subjects of the programme**

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.		
BE2M32DZSA	Digital Signal Processing in Telecommunication	Z,ZK	6	The goal of the subject is to make familiar with theory, methods and implementation of algorithms of the digital signal processing of one- and multi-dimensional signals related to the telecommunication technology.		
BE2M32DSVA	Distributed Computing	Z,ZK	6	The course is focused on technologies that support distributed computing: on mechanisms ensuring reliable, efficient and secure connection of application processes, programming interfaces of communication channels and up-to-date middleware technologies. A significant part of lectures is dedicated to distributed algorithms that assure causality, exclusive access, deadlock detection/avoidance, fault-tolerance, mobile computing, and security.		
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 society is created, transferred, stored in electronic form so information security is very important part of it. Technical background for information security is provided by cryptology.		
BE2M32THOA	Queueing Theory	Z,ZK	6	The aim of the course is to present an overview of dimensioning of telecommunication networks on the basis of results of the queueing theory (QT) and to introduce possibilities of simulation and modelling of networks, both from the point of view of grade of service (GoS) and quality of service (QoS). Results of the QT are applied on different service systems and telecommunication networks being currently operated and developed. Theoretical knowledge about models of service systems can be applied on dimensioning of different service systems in real life - not only on the telecommunications one.		
BE2M32RTK	Telephony Communication Control	Z,ZK	6	The course is oriented to audio or video issues in telecommunication networks, both fixed and mobile. Students will learn principles of switching systems and their management as well as the course will provide them with an overview of signaling systems in central exchanges and networks. The focus is on digital switching systems as circuit as packet switch oriented, i.e. so-called next generation network (NGN) and voice communication in 4G networks. (VoLTE).		

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
AE0M32KMP	<b>Communications and Media Law</b>	Z,ZK	4	2P + 2C	Z,L	V
BE0M16HSD	<b>History of economy and social studies</b> <i>Marcela Efmertová Marcela Efmertová Marcela Efmertová (Gar.)</i>	Z,ZK	4	2P+2S	Z,L	V

BE0M16HT2	<b>History of science and technology 2</b> <i>Marcela Efmertová</i>	Z,ZK	4	2P+2S	L	v
BE0M16FI2	<b>Philosophy II</b>	Z,ZK	4	2P+2S	L	v
BE0M16MPS	<b>Psychology</b>	Z,ZK	4	2P+2S	L	v
BE0M16TE1	<b>Theology</b>	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 transdisciplinary 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 grows our civilization up.		

### List of courses of this pass:

Code	Name of the course	Completion	Credits
AE0M32KMP	Communications and Media Law 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.	Z,ZK	4
BDIP25	Diploma Thesis 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.	Z	25
BE0M16FI2	Philosophy II The course is oriented on the transdisciplinary aspects of philosophy, informatics, physics, mathematics and biology.	Z,ZK	4
BE0M16HSD	History of economy and social studies 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.	Z,ZK	4
BE0M16HT2	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	4
BE0M16MPS	Psychology	Z,ZK	4
BE0M16TE1	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	4
BE2M17ANT	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
BE2M17SBS	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
BE2M31DSPA	Digital Signal Processing The subject gives overview about basic methods of digital signal processing and their applications (examples from speech and biological signal processing): discrete-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 <a href="http://noel.feld.cvut.cz/vyu/be2m31dspa">http://noel.feld.cvut.cz/vyu/be2m31dspa</a> and <a href="http://noel.feld.cvut.cz/vyu/be2m31dspa/a">http://noel.feld.cvut.cz/vyu/be2m31dspa/a</a> ;	Z,ZK	6

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.			
BE2M32DSVA	Distributed Computing	Z,ZK	6
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BE2M32PST	Advanced Networking Technologies	Z,ZK	6
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BE2M32RTK	Telephony Communication Control	Z,ZK	6
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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.			
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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: <a href="http://www.fel.cvut.cz/en/education/semestral-projects.html">http://www.fel.cvut.cz/en/education/semestral-projects.html</a>			

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

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