### Study plan

# Name of study plan: Electrical Engineering, Power Engineering and Management - Electrical Drives

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: Electrical Engineering, Power Engineering and Management

Type of study: Follow-up master combined

Required credits: 116
Elective courses credits: 4
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: 61

The role of the block: P

Code of the group: 2018\_MEEMDIP-K 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	Р

#### Characteristics of the courses of this group of Study Plan: Code=2018\_MEEMDIP-K 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.

Code of the group: 2018\_MEEMH-K Name of the group: Humanities subjects

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5 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
BD0M16FIL	Philosophy 2	Z,ZK	5	14KP+6KS	L	Р
BD0M16HVT	History of science and technology 2	Z,ZK	5	14KP+6KS	L	Р
BD0M16PSM	Psychology Milana Čížek Hrubá, Jaroslav Knápek <b>Josef Černohous</b> Jiří Vašíček (Gar.)	Z,ZK	5	14KP+6KS	Z,L	Р
BD0M16TEO	Theology	Z,ZK	5	14KP+6KS	L	Р

Characteristics of the courses of this group of Study Plan: Code=2018\_MEEMH-K Name=Humanities subjects

	BD0M16FIL	Philosophy 2	Z,ZK	5		
	BD0M16HVT	History of science and technology 2	Z,ZK	5		
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						

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

BD0M16PSM	Psychology	Z,ZK	5
BD0M16TEO	Theology	Z,ZK	5

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.

Code of the group: 2018\_MEEMP-K

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 31 credits

Requirement courses in the group: In this group you have to complete 6 courses

Credits in the group: 31 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
BD1M16EKE1	Economy of Power Industry Jiří Vašíček, Oldřich Starý, Tomáš Králík Tomáš Králík Oldřich Starý (Gar.)	Z,ZK	5	14KP+6KC	L	Р
BD1M15IAP	Engineering Applications	Z,ZK	5	14KP+6KC	Z	Р
BD1M13JAS1	Quality and Reliability	Z,ZK	6	14KP+6KC	Z	Р
BD1MPROJ	Individual project Josef Černohous, Jiří Vašíček, Miroslav Vítek, Zdeněk Müller, Stanislav Bouček Oldřich Starý Oldřich Starý (Gar.)	Z	5	0p+4s	Z	Р
BD1M15PPE1	Elements and Operation of Electrical Power Systems	Z,ZK	5	14KP+6KS	Z	Р
BD1M14SSE	Machinery and Structures of Power Plants	Z,ZK	5	14KP+6KC	Z	Р

Characteristics of the courses of this group of Study Plan: Code=2018\_MEEMP-K Name=Compulsory subjects of the programme

BD1M16EKE1	Economy of Power Industry	Z,ZK	5			
Fundamentals of financ	ng of power companies. Cost structure of power generation and distribution. Prices and tariff systems for power, heat and ga	as production and	distribution.			
Examples of economic evaluation and investment appraisal of the typical project in power sector. Renewable energy sources, externalities. Energy policy and energy law in CR.						
Liberalization and powe	r market development.					

BD1M15IAP	Engineering Applications	Z,ZK	5
BD1M13JAS1	Quality and Reliability	Z,ZK	6

Terminology and definitions from the area of quality and reliability and their control, philosophy of quality, systems of quality control in the world. Reliability as a part of quality. Basic definitions from the area of reliability, basic distributions used in reliability and their basic characteristics. Back-up using a warm and cold standby, types of warm and cold standbys. Reliability of components and systems, calculation of reliability using composition and decomposition. and using a method of a list. Basic statistical methods and tools joined with quality control, managerial tools for quality control. Techniques FMEA and QFFD, house of quality. Capability of a process. Taguchi loss function. Audits. Statistical inspection.

BD1MPROJ Individual project		Z	5				
Independent work in the form of a project. A student will choose a topic from a list of topics specified by branch department. The project will be defended within the framework of a							
subject.							

oubjoot.						
BD1M15PPE1	Z,ZK	5				
BD1M14SSE	Machinery and Structures of Power Plants	Z,ZK	5			
The aim of the course is to acquaint students with forms of energy transformation in power plants, describing the function of power facilities, their structure, properties and characteristics.						

Name of the block: Povinné předměty zaměření Minimal number of credits of the block: 45

The role of the block: PZ

Code of the group: 2018\_MEEMPPS1-K

Name of the group: Compulsory subjects of the specialization

Requirement credits in the group: In this group you have to gain 15 credits

Requirement courses in the group: In this group you have to complete 3 courses

Credits in the group: 15

Note on the group:

Specializace Elektrické pohony

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
BD1M14DEP	Digital Control of Electric Drives	Z,ZK	5	14+61	L	PZ
BD1M14EPT1	Electric Drives and Traction	Z,ZK	5	14KP+6KL	Z	PZ
BD1M14REP	Control and Regulation of Electric Drives	Z,ZK	5	14+61	Z	PZ

Characteristics of the courses of this group of Study Plan: Code=2018 MEEMPPS1-K Name=Compulsory subjects of the specialization

BD1M14DEP Digital Control of Electric Drives

The source deals with basics blocks of control computer for electric drive. It is also discussed the incurs of discretization drive control.

The course deals with basics blocks of control computer for electric drive. It is also discussed the issue of discretization drive control and software and hardware resources needed for developing and debugging control program for electric drive.

BD1M14EPT1 Electric Drives and Traction

Z,ZK

5

The course focuses on the principles of designing electric drives with AC motors in different ways and different types of load, reliability, design for explosive environments and for special purposes and the necessary technical documentation. Students learn the basics of electric traction drives for trams in public transport systems, electric locomotives, as well as the systems of hybrid cars and electric vehicles.

BD1M14REP Control and Regulation of Electric Drives

Z,ZK

5

The course is focused to introduction to the problems of the theory of continuous control of electrical drives and power converters. During the semester are discussed the basics of feedback control, transmission system, determining the stability of the system, including controller types and methods of tuning.

Code of the group: 2018\_MEEMPS-K

Name of the group: Compulsory subjects of the specialization

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 6 courses

Credits in the group: 30 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
BD1M13ASS	Solar Systems Applications Vítězslav Benda, Ladislava Černá, Jakub Holovský, Pavel Hrzina <b>Vítězslav</b> Benda Vítězslav Benda (Gar.)	Z,ZK	5	14KP+6KL	. z	PZ
BD1M13EKP	Ecology and materials	Z,ZK	5	14KP+6KC	Z	PZ
BD1M14ESP	Electric Machinery and Apparatus Pavel Mindl, Vít Hlinovský Pavel Mindl	Z,ZK	5	14KP+6KL	Z	PZ
BD1M15PRE1	Transmission and Distribution of Electricity	Z,ZK	5	14KP+6KS	Z	PZ
BD1M15TVN	High Voltage Engineering	Z,ZK	5	14KP+6KL	. L	PZ
BD1M14TVM	Theory and Application of Power Converters	Z,ZK	5	14KP+6KL	. L	PZ

#### Characteristics of the courses of this group of Study Plan: Code=2018\_MEEMPS-K Name=Compulsory subjects of the specialization

BD1M13ASS | Solar Systems Applications | Z,ZK | 5 The aim of the course is to deepen the knowledge of the properties of semiconductor materials and structures that are important for a deeper understanding of the semiconductor components technology .

BD1M13EKP Ecology and materials

Z.ZK

5

Electrical Technology from the perspective of ecology. Environmental assessment of the various types of surface protection. Environmental aspects of protective systems used in electronics. Environmental impacts of electrical production. Ekodesign proposal of the electrical product. Principles of the proposal product for a difficult operating environment. Disposal of electrical waste.

BD1M14ESP Electric Machinery and Apparatus

Z,ZK

5

The course is focused on contact and solid-state switching devices in LV networks. Basic topologies AC switches and stress of their components, systems with modern semiconductor devices and their protection circuits, testing electrical devices. The course also deals with the general theory of electrical machines. Magnetic field. Fundamentals of commutation. The transformer efficiency, voltage drop. Transients - switch to the network, a short circuit. Mathematical model of synchronous and asynchronous machines. A rotating magnetic field. Induction machine, starting and speed control. Influence of harmonic magnetic field. Single-phase induction motor. Work synchronous machine on a network. Torque, stability, overload capacity.

BD1M15PRE1	Transmission and Distribution of Electricity	Z,ZK	5
BD1M15TVN	High Voltage Engineering	Z,ZK	5
BD1M14TVM	Theory and Application of Power Converters	Z,ZK	5

The course focuses on typical applications of power semiconductor converters on their sizing, switching and protection of power semiconductor converters. It also summarizes the basics of modulation and control strategies of power semiconductor converters and modern trends in their application in electric drives and other applications.

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 10

The role of the block: PV

Code of the group: 2018 MEEMPV1-K

Name of the group: Compulsory elective subjects of the specialization

Requirement credits in the group: In this group you have to gain at least 10 credits (at most 20)

Requirement courses in the group: In this group you have to complete at least 2 courses (at most 4)

Credits in the group: 10 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
BD1M16EUE1	Economy of Energy Use	Z,ZK	5	14KP+6KS	L	PV
BD1M15ELS	Electrical Light	Z,ZK	5	14KP+6KL	. L	PV
BD1M14MDS1	Modeling of Dynamical Systems	Z,ZK	5	14KP+6KC	L	PV
BD1M13VSE	Power components in electrical engineering	Z,ZK	5	14KP+6KL	L	PV

#### Characteristics of the courses of this group of Study Plan: Code=2018\_MEEMPV1-K Name=Compulsory elective subjects of the specialization

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BD1M16EUE1	Economy of Energy Use	Z,ZK	5		
Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary					
energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.					
BD1M15ELS	Electrical Light	Z,ZK	5		
BD1M14MDS1	Modeling of Dynamical Systems	Z,ZK	5		
The course deals with combining knowledge of the dynamics of rigid bodies, fluid mechanics, aerodynamics, gas dynamics and thermodynamics in the compilation of nonlinear models					
of dynamic systems. Seminars are focused on assembling of numeric models in Matlab / Simulink.					
BD1M13VSE	Power components in electrical engineering	Z,ZK	5		
Power semiconductor device (diodes, BJTs, thyristors, MOSFETs and IGBTs) and integraed structures (modules). Structures, function, characteristics and parameters, Passive					
components of powet electronic. Connection of devices in parallel and in series.					

Name of the block: Elective courses Minimal number of credits of the block: 0

The role of the block: V

Code of the group: MTV

Name of the group: Physical education

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
TVV	Physical education	Z	0	0+2	Z,L	V
TV-V1	Physical education	Z	1	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V
TVKLV	Physical Education Course	Z	0	7dní	L	V

#### Characteristics of the courses of this group of Study Plan: Code=MTV Name=Physical education

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

Code of the group: 2018\_MEEMVOL-K 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:

	Name of the course	Completion	Credits
BD0M16FIL	Philosophy 2	Z,ZK	5
BD0M16HVT	History of science and technology 2	Z,ZK	5
his subject traces h	nistorical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate stude	ents' interest in the	history a
aditions of the subj	ject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life	and the influence	of technic
	engineers		
BD0M16PSM	Psychology	Z,ZK	5
BD0M16TEO	Theology	Z,ZK	5
	es to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture to	•	•
re gone through. I h	ne subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones wh - religion from which graws our civilization up.	o want to get know	Christian
BD1M13ASS	Solar Systems Applications	Z,ZK	5
	irse is to deepen the knowledge of the properties of semiconductor materials and structures that are important for a deeper underst	. ,	1
	components technology .	J	
BD1M13EKP	Ecology and materials	Z,ZK	5
Electrical Technolo	ogy from the perspective of ecology. Environmental assessment of the various types of surface protection. Environmental aspects of	f protective system	s used ir
ectronics. Environn	nental impacts of electrical production. Ekodesign proposal of the electrical product. Principles of the proposal product for a difficult of	perating environme	nt. Dispo
	of electrical waste.		
BD1M13JAS1	Quality and Reliability	Z,ZK	6
• • • • • • • • • • • • • • • • • • • •	efinitions from the area of quality and reliability and their control, philosophy of quality, systems of quality control in the world. Reliab area of reliability, basic distributions used in reliability and their basic characteristics. Back-up using a warm and cold standby, type:		•
	nents and systems, calculation of reliability using composition and decomposition. and using a method of a list. Basic statistical metho		•
	agerial tools for quality control. Techniques FMEA and QFFD, house of quality. Capability of a process. Taguchi loss function. Audits		
BD1M13VSE	Power components in electrical engineering	Z,ZK	5
	uctor device (diodes, BJTs, thyristors, MOSFETs and IGBTs) and integraed structures (modules). Structures, function, characteristic	cs and parameters	, Passive
	components of powet electronic. Connection of devices in parallel and in series.		
BD1M14DEP	Digital Control of Electric Drives	Z,ZK	5
he course deals wit	th basics blocks of control computer for electric drive. It is also discussed the issue of discretization drive control and software and h	ardware resources	s needed
	developing and debugging control program for electric drive.		_
BD1M14EPT1	Electric Drives and Traction	Z,ZK	5
ne course locuses (	on the principles of designing electric drives with AC motors in different ways and different types of load, reliability, design for explosiv		
	pecessary technical documentation. Students learn the basics of electric traction drives for trams in public transport systems, electric		-
	necessary technical documentation. Students learn the basics of electric traction drives for trams in public transport systems, electri systems of hybrid cars and electric vehicles.		-
purposes and the r	systems of hybrid cars and electric vehicles.	c locomotives, as	-
purposes and the r		z,ZK	well as the
purposes and the r BD1M14ESP	systems of hybrid cars and electric vehicles.  Electric Machinery and Apparatus	Z,ZK ns with modern ser	well as th
purposes and the r BD1M14ESP The course is focuse evices and their pro transformer efficie	systems of hybrid cars and electric vehicles.  Electric Machinery and Apparatus ad on contact and solid-state switching devices in LV networks. Basic topologies AC switches and stress of their components, system of the contection circuits, testing electrical devices. The course also deals with the general theory of electrical machines. Magnetic field. Fundincy, voltage drop. Transients - switch to the network, a short circuit. Mathematical model of synchronous and asynchronous machines.	Z,ZK ns with modern ser lamentals of commes. A rotating magi	well as th  5 miconduction. The tic field
purposes and the r BD1M14ESP he course is focuse evices and their pro transformer efficie	systems of hybrid cars and electric vehicles.  Electric Machinery and Apparatus  ed on contact and solid-state switching devices in LV networks. Basic topologies AC switches and stress of their components, system of tection circuits, testing electrical devices. The course also deals with the general theory of electrical machines. Magnetic field. Fundincy, voltage drop. Transients - switch to the network, a short circuit. Mathematical model of synchronous and asynchronous machinestarting and speed control. Influence of harmonic magnetic field. Single-phase induction motor. Work synchronous machine on a network.	Z,ZK ns with modern ser lamentals of commes. A rotating magi	5 miconducturation. Tetic field
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BD1M14ESP he course is focuse evices and their protransformer efficie iduction machine, s	systems of hybrid cars and electric vehicles.  Electric Machinery and Apparatus  ed on contact and solid-state switching devices in LV networks. Basic topologies AC switches and stress of their components, system of electrical devices. The course also deals with the general theory of electrical machines. Magnetic field. Fund ncy, voltage drop. Transients - switch to the network, a short circuit. Mathematical model of synchronous and asynchronous machine starting and speed control. Influence of harmonic magnetic field. Single-phase induction motor. Work synchronous machine on a network capacity.  Modeling of Dynamical Systems th combining knowledge of the dynamics of rigid bodies, fluid mechanics, aerodynamics, gas dynamics and thermodynamics in the components.	Z,ZK  ns with modern ser lamentals of comm es. A rotating magn work. Torque, stabil  Z,ZK	5 miconduction. The tic field ity, overlo
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BD1MPROJ	Individual project	Z	5		
Independent work	Independent work in the form of a project. A student will choose a topic from a list of topics specified by branch department. The project will be defended within the framework of a				
	subject.				
BDIP25	Diploma Thesis	Z	25		
Independent final	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		

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