Study plan

Name of study plan: Electrical Engineering, Power Engineering and Management - Technological Systems

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 full-time
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
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_MEEMDIP 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
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
B0M16FIL	*Peter Zamarovský* ***Peter Zamarovský*** *Peter Zamarovský (Gar.)*	Z,ZK	5	2P+2S	Z,L	P
B0M16HVT	**History of science and technology 2** *Marcela Efmertová, Jan Mikeš* ***Marcela Efmertová*** *Marcela Efmertová (Gar.)*	Z,ZK	5	2P+2S	Z,L	P
B0M16HSD1	**History of economy and social studies** ***Marcela Efmertová***	Z,ZK	5	2P+2S	Z,L	P
B0M16PSM	**Psychology** *Jan Fiala* ***Jan Fiala*** *Jan Fiala (Gar.)*	Z,ZK	5	2P+2S	Z,L	P
A003TV	**Physical Education**	Z	2	0+2	L,Z	P
B0M16TEO	**Theology** *Vladimír Slámečka* ***Vladimír Slámečka*** *Vladimír Slámečka (Gar.)*	Z,ZK	5	2P+2S	Z,L	P

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

B0M16FIL		Z,ZK	5

B0M16HVT	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 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			
B0M16HSD1	History of economy and social studies	Z,ZK	5
This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.			
B0M16PSM	Psychology	Z,ZK	5
A003TV	Physical Education	Z	2
B0M16TEO	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
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
B1M16EKE1	**Economy of Power Industry** *Jiří Vašíček, Oldřich Starý, Tomáš Králík* ***Tomáš Králík*** *Oldřich Starý (Gar.)*	Z,ZK	5	2P+2C	L	P
B1M15IAP	**Engineering Applications** *Jan Kyncl Jan Kyncl (Gar.)*	Z,ZK	5	2P+2C	Z	P
B1M13JAS1	**Quality and Reliability** *Pavel Mach, Denis Froš, Martin Molhanec* ***Pavel Mach*** *Pavel Mach (Gar.)*	Z,ZK	6	2P+2C	Z	P
B1MPROJ	**Individual project** *Jiří Vašíček, Oldřich Starý, Jan Kyncl, Jan Jandera, Karel Künzel, Zdeněk Müller, Jaroslav Knápek, Iva Mrkvičková, Josef Černohous, ...* ***Josef Černohous*** *Jan Jandera (Gar.)*	Z	5	0p+4s	Z	P
B1M15PPE1	**Elements and Operation of Electrical Power Systems** *Zdeněk Müller, Ivo Doležel, Jan Hlaváček Zdeněk Müller (Gar.)*	Z,ZK	5	2P+2S	Z	P
B1M14SSE	**Machinery and Structures of Power Plants** *Petr Kočárník, Jiří Šťastný* ***Petr Kočárník*** *Petr Kočárník (Gar.)*	Z,ZK	5	2P+2C	Z	P

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

B1M16EKE1	Economy of Power Industry	Z,ZK	5
Fundamentals of financing of power companies. Cost structure of power generation and distribution. Prices and tariff systems for power, heat and gas 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 power market development.			
B1M15IAP	Engineering Applications	Z,ZK	5
B1M13JAS1	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.			
B1MPROJ	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.			
B1M15PPE1	Elements and Operation of Electrical Power Systems	Z,ZK	5
B1M14SSE	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_MEEMPPS3
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 Technologické systémy

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
B1M13AEZ	**Application of Electrochemical Sources** *Václav Knap, Václav Papež, Pavel Hrzina* ***Václav Knap*** *Václav Knap (Gar.)*	Z,ZK	5	2P+2L	Z	PZ
B1M13MAD	**Control methods and testing in electrotechnology** *Pavel Mach, Radek Procházka, Karel Dušek, Vilém Koblížek, Petr Veselý* ***Karel Dušek*** *Radek Procházka (Gar.)*	Z,ZK	5	2P+2L	L	PZ
B1M13SVS	**Simulation of Production Sytems** *Pavel Mach, Karel Künzel, Jan Zemen* ***Pavel Mach*** *Pavel Mach (Gar.)*	Z,ZK	5	2P+2C	Z	PZ

Characteristics of the courses of this group of Study Plan: Code=2018_MEEMPPS3 Name=Compulsory subjects of the specialization

B1M13AEZ	Application of Electrochemical Sources	Z,ZK	5

After a brief introduction to chemical reactions commonly present in electrochemical sources, the technologies and manufacturing of commonplace accumulator batteries and primary cells are discussed in detail. In the course, there is presented the current state of the field of batteries for different types of applications - electromobility, stationary backup systems and energetics. Emphasis is also placed on the trends in simultaneously using of battery storage for balancing network characteristics, especially in combination with the RES.

B1M13MAD	Control methods and testing in electrotechnology	Z,ZK	5

The course follows the needs of electrical production and research. It discussed diagnostic of materials and measurements of material properties, including measurement of important parameters of production and work environment. The subject also includes testing safe function of products and evaluating the obtained data.

B1M13SVS	Simulation of Production Sytems	Z,ZK	5

The course is focused at methods of static and dynamic models of processes and systems forming. Basic types of models are described and characterized. Models are built up using an analytical way on the basis of knowledge of relationships between parameters, or using an experimental way. Factorial experiments for qualitative variables are presented. Computer aided generation of mathematical models and simulation of dynamic behavior of processes and systems are described. Basic methods of component models compilation, assembly of a complete model are presented. The application on computer modeling and simulation of electrical, thermal and mechanical systems in power electrical engineering completes the lectures.

Code of the group: 2018_MEEMPS
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
B1M13ASS	**Solar Systems Application** *Vítězslav Benda, Jakub Holovský* ***Jakub Holovský*** *Vítězslav Benda (Gar.)*	Z,ZK	5	2P+2L	Z	PZ
B1M13EKP	**Ecology and materials** *Ivan Kudláček, Eva Horynová, Jan Weinzettel, Branislav Dzurňák* ***Ivan Kudláček*** *Ivan Kudláček (Gar.)*	Z,ZK	5	2P+2L	Z	PZ
B1M14ESP	**Electric Machinery and Apparatus** *Ondřej Lipčák, Pavel Mindl* ***Pavel Mindl*** *Pavel Mindl (Gar.)*	Z,ZK	5	2P+2L	Z	PZ
B1M15PRE1	**Transmission and Distribution of Electricity** *Zdeněk Müller, Ivo Doležel, Ladislav Musil Zdeněk Müller (Gar.)*	Z,ZK	5	2P+2S	Z	PZ
B1M15TVN	**High Voltage Engineering** *Jan Hlaváček, Jan Koller*	Z,ZK	5	2P+2L	L	PZ
B1M14TVM	**Theory and Application of Power Converters** *Jiří Lettl* ***Jiří Lettl*** *Jiří Lettl (Gar.)*	Z,ZK	5	2P+2L	L	PZ

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

B1M13ASS	Solar Systems Application	Z,ZK	5

Solar energy. Photovoltaic phenomena. Photovoltaic cells and modules and their characteristics. Photovoltaic systems and their applications. Photo-thermal phenomena.Photo-thermal power stations. Significance, economic and environmental aspects of solar energy exploitation.

B1M13EKP	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.

B1M14ESP	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.

B1M15PRE1	Transmission and Distribution of Electricity	Z,ZK	5
B1M15TVN	High Voltage Engineering	Z,ZK	5
B1M14TVM	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
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
B1M16EUE1	**Economy of Energy Use** *Jiří Beranovský **Jiří Beranovský** Jiří Beranovský (Gar.)*	Z,ZK	5	2P+2S	L	PV
B1M15ELS	**Electrical Light** *Petr Žák*	Z,ZK	5	2P+2L	L	PV
B1M14MDS1	**Modeling of Dynamical Systems** *Petr Kočárník **Petr Kočárník** Petr Kočárník (Gar.)*	Z,ZK	5	2P+2C	L	PV
B1M13VSE	**Power components in electrical engineering** *Václav Papež **Václav Papež** Václav Papež (Gar.)*	Z,ZK	5	2P+2L	L	PV

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

B1M16EUE1	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.			
B1M15ELS	Electrical Light	Z,ZK	5
B1M14MDS1	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.			
B1M13VSE	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
A003TV	**Physical Education**	Z	2	0+2	L,Z	V
TV-V1	**Physical education**	Z	1	0+2	Z,L	V
TVV0	**Physical education**	Z	0	0+2	Z,L	V
TVKLV	**Physical Education Course**	Z	0	7dní	L	V
TVKZV	**Physical Education Course**	Z	0	7dní	Z	V

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

A003TV	Physical Education	Z	2
TVV	Physical education	Z	0
TV-V1	Physical education	Z	1
TVV0	Physical education	Z	0
TVKLV	Physical Education Course	Z	0

TVKZV	Physical Education Course	Z	0

Code of the group: 2018_MEEMVOL
Name of the group: Elective subjects
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group: ~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách http://www.fel.cvut.cz/cz/education/volitelne-predmety.html\\

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
B0M16FIL		Z,ZK	5
B0M16HSD1	History of economy and social studies	Z,ZK	5
This subject deals with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims and achieved results as well as the social and cultural development and coexistence of the various ethnical groups in the Czech countries.			
B0M16HVT	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 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			
B0M16PSM	Psychology	Z,ZK	5
B0M16TEO	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.			
B1M13AEZ	Application of Electrochemical Sources	Z,ZK	5
After a brief introduction to chemical reactions commonly present in electrochemical sources, the technologies and manufacturing of commonplace accumulator batteries and primary cells are discussed in detail. In the course, there is presented the current state of the field of batteries for different types of applications - electromobility, stationary backup systems and energetics. Emphasis is also placed on the trends in simultaneously using of battery storage for balancing network characteristics, especially in combination with the RES.			
B1M13ASS	Solar Systems Application	Z,ZK	5
Solar energy. Photovoltaic phenomena. Photovoltaic cells and modules and their characteristics. Photovoltaic systems and their applications. Photo-thermal phenomena.Photo-thermal power stations. Significance, economic and environmental aspects of solar energy exploitation.			
B1M13EKP	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.			
B1M13JAS1	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.			
B1M13MAD	Control methods and testing in electrotechnology	Z,ZK	5
The course follows the needs of electrical production and research. It discussed diagnostic of materials and measurements of material properties, including measurement of important parameters of production and work environment. The subject also includes testing safe function of products and evaluating the obtained data.			
B1M13SVS	Simulation of Production Sytems	Z,ZK	5
The course is focused at methods of static and dynamic models of processes and systems forming. Basic types of models are described and characterized. Models are built up using an analytical way on the basis of knowledge of relationships between parameters, or using an experimental way. Factorial experiments for qualitative variables are presented. Computer aided generation of mathematical models and simulation of dynamic behavior of processes and systems are described. Basic methods of component models compilation, assembly of a complete model are presented. The application on computer modeling and simulation of electrical, thermal and mechanical systems in power electrical engineering completes the lectures.			
B1M13VSE	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.			
B1M14ESP	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.			
B1M14MDS1	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.			

B1M14SSE	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.			
B1M14TVM	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.			
B1M15ELS	Electrical Light	Z,ZK	5
B1M15IAP	Engineering Applications	Z,ZK	5
B1M15PPE1	Elements and Operation of Electrical Power Systems	Z,ZK	5
B1M15PRE1	Transmission and Distribution of Electricity	Z,ZK	5
B1M15TVN	High Voltage Engineering	Z,ZK	5
B1M16EKE1	Economy of Power Industry	Z,ZK	5
Fundamentals of financing of power companies. Cost structure of power generation and distribution. Prices and tariff systems for power, heat and gas 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 power market development.			
B1M16EUE1	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.			
B1MPROJ	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.			
BDIP25	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

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