University of Žilina

Faculty of Electrical Engineering and Information Technology

GUIDE TO DOCTORAL DEGREE STUDY

STUDY PROGRAMME: POWER ELECTRICAL ENGINEERING
FIELD OF STUDY: ELECTRICAL ENGINEERING

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1. DETAILS ON THE STUDY PROGRAMME

1.1 Characteristics of the Study Programme

Name of the study programme: Power Electrical Engineering

Name of the field of study: Electrical Engineering

Degree of higher education: Third (doctoral degree study programme)

Form of study: full-time/part-time

Requirements for Applicants for Study: The basic condition for admission to the doctoral degree study (study programme of the third degree) is the full completion of the second degree of higher education in the cybernetics, electrical engineering, or computer science fields of study. Other conditions of admission are stated in the document Principles and rules of the admission procedure for studying at the Faculty of Electrical Engineering and Information Technology (available at: https://feit.uniza.sk/en/doctoral-studies/)

1.1.1 Graduate Profile

A graduate of the 3rd level of the study program Power Electrical Engineering in the field of Electrical Engineering represents a qualified expert with unique knowledge and skills reflecting current and modern trends in the field of power electrical engineering. This mainly concerns the fields of power engineering, power electronics and electric drives, including systems for automotive and electromobility applications. The added value of studying the field of electrical engineering in the given program is the expansion of knowledge in the field of control systems, including the design, optimization, and implementation of control algorithms.

The graduate has broad professional knowledge from several areas from the field of the study, which serve as a basis for carrying out research and development of new knowledge within traditional areas, such as: methods of analysis and synthesis of energy systems, electrotechnical systems, power semiconductor systems and electric drives, their design and management.

The graduate has professional and methodological knowledge of an interdisciplinary character, based on which he can be profiled within interdisciplinary areas such as electromagnetic compatibility, thermal management, energy storage systems, and design and implementation of their control algorithms.

The graduate is able, by applying scientific methods, to solve research problems in specialized areas of energy, industry, transport and other application areas in accordance with the priorities formulated for the areas of basic and applied research.

The graduate is able to demonstrate a systematic understanding of the field of study and the acquisition of the skills and methods of scientific research associated with the given field corresponding to the current state of knowledge in the field of electrical engineering and control systems. He knows how to choose specific scientific methods of basic and applied research in one of the areas of electric power engineering, power electronics, electric drives and their industrial and transport applications.

The graduate is capable of critical analysis, abstraction, evaluation and generalization of the given issue and synthesis of new and complex concepts. Demonstrates the ability to conceive, construct, implement and edit a substantial part of research with scientific integrity. He applies and implements his own findings from his theoretical analysis and his complex scientific research in solving problems. With his original research, he contributes to expanding the boundaries of scientific knowledge through the realization of an extensive set of works, some of which are worthy of peer-reviewed publication at

the national or international level. The graduate is characterized by independent, critical and analytical thinking, which he applies in adapting conditions.

The graduate is ready to present the results achieved within the studied program in front of a wide professional public. He is able to present the achieved results at professional scientific symposia, conferences and workshops. The graduate can interpret the dissemination of the results of scientific and research activities not only in his mother language, but also using a selected world language. In addition to the presentation of the achieved results, he is also able to adequately confront them with a professional audience.

By applying the acquired knowledge, he is able to analyze and evaluate the investigated problems, while the common denominator of his work is creative thinking, at the highest cognitive level. He perceives solving tasks and related problems as a challenge. He can evaluate the results of his work and also other professional works with a valid, reliable and transparent approach. Within the process of confronting the scientific results and at the same time within the pedagogical process, in relation to students of lower study degrees, he uses constructive feedback and critical thinking. He places maximum emphasis on the accuracy and quality of his scientific outputs. At the same time, he effectively, creatively and eruditely uses the potential of powerful computer technology and available study literature.

The graduate is able to take social, scientific and ethical aspects into account when formulating research objectives and interpreting research results. He can determine the focus of research and coordinate the team in the relevant scientific field. In an academic and professional context, its ability to support technological, social or cultural progress in a knowledge-based society is expected.

In the field of electrical engineering and the afore mentioned specializations, he is an experienced and sought-after specialist, and his applicability on the labor market is relatively high.

1.1.2 Parts of the Doctoral Degree Study

The study of a doctoral degree study programme (hereinafter referred to as "doctoral degree study") is governed by the provisions stipulated in the Directive No. 110 – Study Regulations for the Third Degree of the University Study at the University of Žilina *https://uniza.sk/images/pdf/kvalita/EN/smernica-UNIZA-c-110-en.pdf* and the Directive No. 216 – Quality Assurance of the Doctoral Degree Studies at the University of Žilina *https://uniza.sk/images/pdf/kvalita/EN/smernica-UNIZA-c-216-en.pdf* and/or the Directive No. 198 – Support for Applicants for Study and Students with Specific Needs at the University of Žilina Smernicou č. 198 *Podpora uchádzačov o štúdium a študentov so špecifickými potrebami na Žilinskej univerzite v Žiline*.) The doctoral degree study at the Faculty of Electrical Engineering and Information Technology is monitored by a working group of the field committee (WG FC) established for a given study programme (see Chapter 2 for more details).

The doctoral degree study is conducted according to an individual study plan under the guidance of a supervisor, while the set of knowledge, skills, and abilities is adapted to the specific topic of the dissertation. The basis for the set of knowledge comprises the following disciplines: Mathematics, physics, theory of automatic regulation, electrical engineering, power electronics and power electronic systems, electric machines and electric drives, embedded systems, intelligent power grids and power quality, control of electrical installations and transmission lines.

The individual study plan (hereinafter referred to as **ISP**) is elaborated by the supervisor in cooperation with a PhD. student according to the needs of the selected dissertation in accordance with the assurance of the required quality of scientific work and education of PhD. students. Subsequently, it is submitted for approval to the members of the WG FC through its chairperson and to the guarantor of the relevant study programme (hereinafter referred to as SP). WG FC is established according to the internal regulations of the faculty. After its approval, the dean of the faculty finally comments on it.

As part of the evaluation of the study, credits are allocated to a PhD. student for individual activities. A prerequisite for the successful completion of the doctoral degree study is that the PhD. student has obtained at least 180 credits during the doctoral degree study. The doctoral degree study consists of a study, a scientific and a pedagogical part.

The study part represents at least 50 credits of the ISP. It consists of the study of two compulsory courses, two compulsory elective courses, and the compulsory course 'Essay to Dissertation Examination and Defence of Written Project for Dissertation Examination'. The compulsory courses are 'Basics of Research Practice' and 'Foreign Language'. Selection of the two compulsory elective courses depends on a topic of a dissertation thesis and it is specified in the ISP of a PhD. student. All courses of the study part are the state examination courses. A more detailed description is given in the section 1.2.

The scientific part represents at least 130 credits of the ISP. It is conducted by means of dissertation projects I to IV, individual and team scientific work, including the elaboration and the defence of the dissertation thesis. Dissertation projects I, II, III, and IV represent consequential parts (stages) of the dissertation thesis. The allocation of credits for individual and team scientific work is determined by Table 1, while the number of credits for published scientific papers shall be determined according to the percentage share of the PhD. student in the publication output.

As a rule, an integral part of the activities of a PhD. student in the full-time form of study, prescribed in the ISP, is the active participation of the PhD. student in a foreign study stay at a partner workplace of the PhD. student's training institute. It is recommended to include in the PhD. student's ISP the completion of a foreign study stays lasting at least two months or one semester (Directive No. 110 – *Study Regulations for the Third Degree of the University Study at the University of Žilina*). For this foreign study stay, the PhD. student is awarded additional credits as stated in Table 3.

A condition for the proper completion of the doctoral degree study is the passing of the Dissertation examination, which is the state examination, and the dissertation thesis' defense. The dissertation thesis represents a final thesis. After the dissertation thesis has been elaborated, accepted, and defended, the PhD. student will receive 30 credits (the course 'The Thesis and Dissertation Defence ').

The pedagogical part is the teaching activity stipulated in the ISP in the full-time form of study for a maximum of 4 hours per week on average per academic year; in the part-time form of study, there is the obligation to provide selected professional lectures and to perform other professional activities.

Table 1 Allocation of credits for individual and team scientific work

Assessment of the individual and team scientific work	**Credits**
Dissertation projects (they form consequential parts of the dissertation thesis) – **compulsory**	
Dissertation project I	10
Dissertation project II	10
Dissertation project III	10
Dissertation project IV	10
Published scientific papers	
Papers registered in the WoS database**	
- paper in an impacted journal with quartile Q1	80*
- paper in an impacted journal with quartile Q2	60*
- paper in an impacted journal with quartile Q3	40*
- paper in an impacted journal with quartile Q4	20*
- conference papers and proceedings (collections)	20*
Papers registered in the SCOPUS database***	

- paper in an impacted journal with quartile Q1 - paper in an impacted journal with quartile Q2 - paper in an impacted journal with quartile Q3 - paper in an impacted journal with quartile Q4 - conference papers and proceedings (collections)	40* 30* 20* 10* 10*
Other papers in journals or conference proceedings in a world language / the Slovak language	8/4*
Paper (chapter) in a monograph, university textbook in a world language / other language	20/10*
Protected outputs related to the dissertation - patent - utility model	 60* 30*

Responses

citation registered in the SCI citation index	2

Active presentation of results

- at one international conference abroad or at home in a world language**** - at other conferences	10 5

* the number of credits shall be determined by the percentage share of the PhD. student in the publication output.

** http://www.isiknowledge.com/WOS

*** http://www.scopus.com/home.url

**** also in case of presenting more than one paper

Credits are awarded only for publications related to the topic of the dissertation, elaborated in collaboration with the supervisor. They are listed in the annual evaluation of a PhD. student.

1.1.3 Rules and Conditions for the Elaboration of the Individual Study Plans

The basic rules and conditions for the elaboration of ISP are defined in the provisions stipulated in the Directive No. 110 – *Study Regulations for the Third Degree of the University Study at the University of Žilina* and the Directive No. 216 – *Quality Assurance of the Doctoral Degree Studies at the University of Žilina*.

The ISP of the PhD. student contains a list of courses to be completed by a PhD. student, a list of courses for the Dissertation examination selected from the list approved by the WG FC, and a list of required and recommended literature to be studied by a PhD. student as part of his/her individual preparation for the Dissertation examination. The ISP of a PhD. student also includes the deadlines for the completion of the individual courses and the Dissertation exam. An integral part of the activities of a PhD. student prescribed in the ISP is the active participation of a PhD. student at international conferences, especially those indexed in the international databases (WoS, SCOPUS), and publication in scientific journals, while at least one paper is published in an impacted journal. It is recommended to include the obligation to publish at least one paper in an impacted journal that has been assigned a quartile of at least Q3 in the Web of Science or at least Q2 in the SCOPUS database in the ISP of a PhD. student. It is recommended to include the completion of a foreign study stay in the ISP of a PhD. student.

The ISP is elaborated by a supervisor in collaboration with a PhD. student according to the needs of the selected dissertation thesis in accordance with the quality assurance of the scientific work and education of PhD. students on a prescribed up-to-date form of the Faculty of Electrical Engineering and Information Technology (https://feit.uniza.sk/en/doctoral-studies/)

The standard length of **full-time** study: **3 years**
The standard length of **part-time** study: **4 years**

The division of the study into parts and the conditions for advancement to the next year of study are expressed in terms of the number of credits obtained.

A supervisor continuously assesses the quality and the level of the fulfilment of the ISP of a PhD. student as well as compliance with deadlines, and he/she proposes the allocation of credits for individual and team scientific work.
A supervisor shall elaborate annual evaluation of a PhD. student's fulfilment of the ISP (**Annual Evaluation of a PhD. student**) by August 31 of the corresponding academic year, including a statement as to whether or not he/she recommends the continuation of the doctoral degree study. In doing so, a supervisor shall assess the status and level of fulfilment of the ISP of a PhD. student, compliance with deadlines, award credits, and, if necessary, submit a proposal for modification of the ISP of a PhD. student. The annual evaluation of a PhD. student is approved by a guarantee of a relevant study programme and subsequently by a dean. Based on the annual evaluation of a PhD. student, a dean decides whether a PhD. student may continue his/her study and on any changes to his/her study programme.

1.2 Organisation of the Study - Full-time Study

The basic part of the study is a year of study, which begins on September 1 and ends on August 31 of the relevant academic year. The full-time study is divided into years as follows:
The first year - a student shall obtain a minimum of 40 credits,
The second year - a student shall obtain a minimum of 60 credits or a total of at least 100 credits for the first and the second year.
The third year - a student shall obtain enough credits to achieve a minimum of 180 credits for the entire course of study.

The condition for advancement to the next year of the study is the acquisition of the prescribed number of credits in a given academic year. Failure to meet this requirement will result in the withdrawal a student from the study. The individual study plan is designed in such a way that by completing it the student will meet the conditions for the proper study completion (graduation) within the standard length of study.

Other conditions for the proper completion of the study:

- successful completion of compulsory and compulsory elective courses of the study programme in accordance with the rules and conditions for the design of the ISP,
- publication of the results obtained during the study, which are related to the topic of the dissertation thesis. The minimum requirement is the publication of at least one scientific paper in a foreign impacted scientific journal, in a world language, which has been assigned a quartile of at least Q3 in the Web of Science or at least Q2 in the SCOPUS database, while a PhD. student as an author or a co-author should have at least 25% share in the respective publication (at the time of the dissertation thesis defense, the PhD. student must submit a published article or a confirmation of its acceptance),
- passing the state examinations (in accordance with the study regulations), which are:
  - dissertation examination – in the full-time form of study, a PhD. student shall apply for the dissertation examination no later than 18 months from the date of enrolment in the study. It is recommended to take the dissertation examination within 12 months from the date of enrolment. The dissertation examination consists of a part consisting of a debate on the written work for the dissertation examination and a part in which a PhD. student shall demonstrate his/her theoretical knowledge in the specified courses of the examination dissertation. A PhD. student may also take examinations from individual courses during the

study part of the doctoral degree study before the debate on the written work for the dissertation examination,
- successful dissertation thesis defense.

As a rule, active participation of a PhD. student in a foreign study stay at a partner workplace of a PhD. student's training institute of at least two months (cumulatively) is an integral part of the study. In the case of objective reasons, it is possible to establish, in agreement with a dean of the faculty, an alternative fulfilment of the above requirement based on a justified request of a supervisor.

Table 2a Recommended ISP – full-time study

Type of the course (selectiveness)	**Course name**	**Credits**	**The extent of teaching activities**	**Completion**
The first year				
Cmp	Basics of Research Practice	10	2-0-0	SE
CmpE	Compulsory elective course I	10	2-0-0	SE
CmpE	Compulsory elective course II	10	2-0-0	SE
Cmp	Foreign Language	10	2-0-0	SE
	Pedagogical Activity	-	0-0-4	-
	Individual and Team Scientific Work	*		C
The second year				
Cmp	Essay to Dissertation Examination and Defence of Written Project for Dissertation Examination	10		SE
	Individual and Team Scientific Work	*		C
	Pedagogical Activity	-	0-0-4	-
	Dissertation project I	10		C
The third year				
	Individual and Team Scientific Work	*		C
	Pedagogical Activity	-	0-0-4	-
	Dissertation project II**	10		C
	Dissertation project III**	10		C
	Dissertation project IV	10		C
Cmp	The Thesis and Dissertation Defence	30		SE

* The number of awarded credits is stated in Table 1.

** The student can also take the course during the second year of the doctoral degree study

Notes:
- SE - state examination, C - credits, Cmp – compulsory subject, CmpE – compulsory elective subject
- In any semester a PhD. student may additionally enrol for another compulsory elective course (CmpE)
- The table indicates the weekly range of obligations.

1.3 Organisation of the Study - Part-time Study

The basic part of the study is a year of study, which begins on September 1 and ends on August 31 of the relevant academic year. A part-time student completes his/her study obligations similar to a full-time student, with the exception of a foreign study stay.

In an individual study plan, the study obligations are spread over 4 years of study, provided that the following conditions are met:

The first year - a student shall obtain a minimum of 30 credits,
The second year - a student shall obtain enough credits to achieve a total of at least 90 credits for the first and the second year,
The first year - a student shall obtain a minimum of 45 credits,
The fourth year - a student shall obtain enough credits to achieve a minimum of 180 credits for the entire course of study.

Other conditions for the proper completion of the study are similar to those for the full-time form of study:

- successful completion of compulsory and compulsory elective courses of the study programme in accordance with the rules and conditions for the design of the ISP,
- publication of the results obtained during the study, which are related to the topic of the dissertation thesis. The minimum requirement is the publication of at least one scientific paper in a foreign impacted scientific journal, in a world language, which has been assigned a quartile of at least Q3 in the Web of Science or at least Q2 in the SCOPUS database, while a PhD. student as an author or a co-author should have at least 25% share in the respective publication (at the time of the dissertation thesis defense, the PhD. student must submit a published article or a confirmation of its acceptance),
- passing the state examinations (in accordance with the study regulations), which are:
  - dissertation examination – in the part-time form of study, a PhD. student shall apply for the dissertation examination no later than 36 months from the date of enrolment in the study, it is recommended to do so no later than 24 months. The dissertation examination consists of a part consisting of a debate on the written work for the dissertation examination and a part in which a PhD. student shall demonstrate his/her theoretical knowledge in the specified courses of the dissertation examination. A PhD. student may also take examinations from individual courses during the study part of the doctoral degree study before the debate on the written work for the dissertation examination,
  - successful dissertation thesis defense.

The pedagogical activity may be replaced by the delivery of selected professional lectures and the performance of other professional activities.

Table 2b Recommended ISP – part-time study

Type of the course (selectiveness)	**Course name**	**Credits**	**The extent of teaching activities**	**Completion**
The first year				
Cmp	Basics of Research Practice	10	2-0-0	SE
CmpE	Compulsory elective course I	10	2-0-0	FSE
Cmp	Foreign Language	10	2-0-0	SE
	Individual and Team Scientific Work	*		C
The second year				
CmpE	Compulsory elective course II	10	2-0-0	SE
Cmp	Essay to Dissertation Examination and Defence of Written Project for Dissertation Examination	10		SE
	Individual and Team Scientific Work	*		C

The third year

	Individual and Team Scientific Work	*		C
	Dissertation project I	10		C
	Dissertation project II	10		C

The fourth year

	Individual and Team Scientific Work	*		C
	Dissertation project III	10		C
	Dissertation project IV	10		C
Cmp	The Thesis and Dissertation Defence	30		SE

* The number of awarded credits is stated in Table 1.
Note: See also the notes regarding the study plan for the full-time study.

1.4 List of Compulsory and Compulsory Elective Courses

Compulsory courses

Type of the course (selectiveness)	Course name	Credits	The extent of teaching activities	Completion
Comp	Basics of Research Practice	10	2-0-0	SE
Comp	Foreign Language	10	2-0-0	SE
Comp	Essay to Dissertation Examination and Defence of Written Project for Dissertation Examination	10		SE
Comp	The Thesis and Dissertation Defence	30		SE

Compulsory elective courses

Type of the course (selectiveness)	Course name	Credits	The extent of teaching activities	Completion
CmpE	Selected topics from mathematics	10	2-0-0	SE
CmpE	Electrical drives and electric traction	10	0-2-0	SE
CmpE	Electrical machines	10	0-2-0	SE
CmpE	Electromagnetic compatibility	10	0-2-0	SE
CmpE	Physics	10	0-2-0	SE
CmpE	Programming	10	0-2-0	SE
CmpE	Theory of automatic control	10	0-2-0	SE
CmpE	Power electronics	10	0-2-0	SE
CmpE	Power electronic systems	10	0-2-0	SE
CmpE	Intelligent grids	10	0-2-0	SE
CmpE	Power quality	10	0-2-0	SE
CmpE	Modelling of power system operation	10	0-2-0	SE
CmpE	Control of power system operation	10	0-2-0	SE

1.5 Provision of the Individual Study Plan for a PhD. Student

The basic regulation for the provision of individual study plan for a doctoral student is the Directive No. 110 *Study Regulations for the Third Degree of University Study at the University of Žilina*.

PhD. students in the full-time form of doctoral study are bound by the decisions and regulations of a head of the department in cooperation with a supervisor and a head of the training institute where they are studying. They respect the established rules at their workplace. PhD. students in the full-time form of doctoral study take part in activities of their workplace, in line with their individual study plan (regarding its study, scientific as well as pedagogical aspects). Further obligations of PhD. students and the requirements of doctoral study are laid down in Articles 4 and 5 of this Directive.

Obligations of supervisors are governed by Article 6 of the Directive No. 110 *Study Regulations for the Third Degree of the University Study at the University of Žilina*.

1.5.1 Dissertation Examination

The details regarding the dissertation examination are listed in the Decision of the Dean of the Faculty of Electrical Engineering and Information Technology on the Organisation and Administrative Provision for the 3rd Degree of Study (https://feit.uniza.sk/en/doctoral-studies/).

1.5.2 Course Examinations

The examinations regarding the individual courses can be completed even during the study part of the doctoral study, before the dissertation examination, but only following the proposal of the supervisor and after the approval of a chairperson of the working group. A chairperson of the working group can give the approval for one PhD. student for several examinations, or for certain examinations of several PhD. students. In such cases, the examination shall be held in front of a committee, in the presence of a course teacher, a supervisor (in justified cases, a supervisor's delegate), and two other members, one of which is usually from an external environment outside the training institute. The completion of individual courses is evaluated by the grade. All examinations take place in accordance with the provisions found in the Directive No. 110 *Study Regulations for the Third Degree of University Study at the University of Žilina* and in the Decision of the Dean of the Faculty of Electrical Engineering and Information Technology on the Organisation and Administrative Provision for the 3rd Degree of Study in the given academic year.

"Basics of Research Practice" Course Examination

During the semester, a PhD. student attends selected lectures related to their scientific work, including the ethics of scientific work and the presentation of achieved results. A PhD. student continuously studies scientific articles related to the topic of the dissertation thesis and prepare a scientific paper in a world language suitable for publication at an international conference, or in a journal, as well as for the defense in front of professionals. The completed paper along with its presentation will be evaluated by a committee during the oral examination. The examination consists of an oral dispute on the prepared paper by a PhD. student.

"Foreign Language" Course Examination

The examination follows the rules listed below:

- an examiner, in cooperation with a supervisor, determines the scope and range of study from a selected literature in a relevant world language; the recommended range is 100-150 pages;
- a PhD. student presents the acquired knowledges from the literature in a world language within 15 minutes,
- an examiner, appointed by a chairperson of the field committee working group, designates a short text from the prescribed literature to be read and translated by the PhD. student. An examiner shall ensure that the text is available to all members of an examination committee;
- this is followed by a free discussion regarding the topic of the exam, conducted in a relevant world language;

- for the final evaluation of the Foreign Language course, a committee also takes into account the percentage of success in the previous 2 semesters of language education.

Based on the previous approval of a supervisor and a chairperson of the field committee working group, the examination of the "Foreign Language" course can be conducted along with the "Basics of Research Practice" course examination. In this case, the study of scientific articles related to the preparation of the paper for publication represents the selected scientific literature in the relevant world language. An examiner, appointed by a chairperson of the field committee working group, determines the relevant text from the selected scientific literature, which a PhD. student reads and translates. The next part of the examination is the presentation of the paper and a discussion. Each subject is graded individually.

1.5.3 Allocation of Credits for Foreign Study Stay

Before travelling abroad for a study stay within an optional mobility programme, a PhD. student, in cooperation with a supervisor and the host institution, defines a timetable for the stay containing relevant tasks and expected outcomes. Credits will be allocated for the active foreign study stay in the scientific part of the doctoral study according to the duration of the stay.

According to the duration, a PhD. student can take part in a short-term stay – 30 days or fewer, or a long-term stay – 31 days and more.

Table 3 Allocation of Credits *for an Active Participation of a PhD. Student on a Short-term Foreign Study Stay*

Duration of a Foreign Short-term Scholarship of a PhD. Student	**Credits**
7 days or fewer	3
8 ÷ 14 days	6
15 ÷ 21 days	9
22 ÷ 30 days	12

Table 4 Allocation of Credits *for an Active Participation of a PhD. Student on a Long-term Foreign Study Stay*

Duration of a Foreign Long-term Scholarship of a PhD. Student	**Credits**
31 ÷ 60 days	15
61 ÷ 90 days	20
91 ÷ 120 days	25
121 days and more	30

1.1.5. Departmental Dissertation Thesis Defense

The departmental dissertation thesis defense takes place at the department – PhD. student's training workplace, no later than 2 weeks before the dissertation thesis submission date. The departmental dissertation thesis defense aims to critically assess the content of the dissertation thesis and to comprehensively acquaint the department with the results achieved during its completion. For the departmental defense, a PhD. student submits the dissertation in a prescribed form not yet bound. After the submission of the dissertation thesis, a supervisor shall nominate a departmental reviewer to a chairperson of the working group. A chairperson of the working group appoints the departmental reviewer and asks him/her to prepare an expert opinion. After consultation with a reviewer, the chairperson will determine the date of the departmental dissertation thesis defense.

This defense proceeds as follows:

a) a supervisor informs the department of his/her evaluation of a PhD. student;
b) a PhD. student presents his/her dissertation thesis;
c) a departmental reviewer presents his/her expert opinion and comments;
d) a PhD. student provides a detailed response to the reviewer's comments;
e) the defense concludes with mandatory recommendations that a PhD. student must fulfil before the final submission of the dissertation thesis.

1.1.6. Dissertation Thesis

The details regarding the dissertation thesis defense are listed in the Decision of the Dean of the Faculty of Electrical Engineering and Information Technology on the Organisation and Administrative Provision for the 3rd Degree of Study (https://feit.uniza.sk/en/doctoral-studies/).

2. WORKING GROUP OF THE FEIT UNIZA FIELD COMMITTEE

2.1. Introductory Provisions

a) A working group of a field committee (hereinafter referred to as WG FC) is a group established for doctoral study according to Part 5, Section 54, par. 17 of Act No. 131/2002 Coll. on Higher Education Institutions and on Amendments to Certain Acts, as amended (hereinafter referred to as the Act). For the accredited study programme Power electrical engineering of the study field Electrical engineering (hereinafter referred to as the field) of the doctoral study for providing and awarding the academic title „Philosophiae doctor" (abbreviation PhD.), the working group Power electrical engineering of the field committee Electrical engineering is established.
b) The establishment of the WG FC follows the Directive No. 110 *Study Regulations for the Third Degree of University Study at the University of Žilina* and the Directive No. 216 *Quality Assurance of the Doctoral Degree Studies at the University of Žilina*.

2.2. Rules of Procedure for the Field Committee Working Group

The field committee working group is appointed by a dean after the approval of the Faculty's Scientific Board. The composition of the WG FC follows the Directive No. 110 *Study Regulations for the Third Degree of the University Study at the University of Žilina*. At the first meeting, governed by a dean of the faculty, the members of the WG FC shall vote a chairperson of the WG FC.

Meetings of the WG FC are governed by the following principles:

- The meetings of WG FC take place usually twice a year; meeting of the WG FC is called by a chairperson, who simultaneously sets the agenda for the meeting of the WG FC. In special cases, the meeting of WG FC may be called by a dean of the Faculty of Electrical Engineering and Information Technology (FEEIT), UNIZA. If this happens, a dean also sets the agenda for the meeting.
- A dean of the Faculty of Electrical Engineering and Information Technology has the right to participate in the meetings of the WG FC, but does not have the right to vote if he/she is not member of the WG FC;
- a chairperson of the WG FC submits the copy of the minutes from the WG FC meeting to the Student Affairs Department for archiving; the meeting of the WG FC shall be governed by the set agenda; the WG FC has a quorum if at least 1/2 of its members are present; a vote shall be valid if the majority of present members vote in favour of a proposal;
- in exceptional cases, voting may be carried out by correspondence or by electronic means. A correspondence or electronic voting shall be valid provided that 2/3 of the WG FC members are present. For a valid vote, the approval of a majority of the voting members is required.

The list of WG FC members for the doctoral study: Power electrical engineering is available at the faculty's website: (https://feit.uniza.sk/en/doctoral-studies/).

3. FINAL PROVISIONS

Related mandatory documentation on the organisation of the doctoral study and activities of the field committee's working group:

Act No. 131/2002 Coll. *on Higher Education Institutions and on Amendments to Certain Acts, as amended*.

Directive No.110 *Study Regulations for the Third Degree of University Study at the University of Žilina.*

Directive No. 216 *Quality Assurance of the Doctoral Degree Studies*

Directive No.215 *On Final, Rigorous, and Habilitation Theses under the Conditions of the University of Žilina*

METHODOLOGICAL GUIDELINE No. 3/2022 to Directive No. 215 On Final, Rigorous and Habilitation Theses under the Conditions of the University of Žilina

Directive No.207 *UNIZA Code of Ethics*

Directive No. 226 *On Copyright Ethics and the Elimination of Plagiarism under the Conditions of the University of Žilina*

Methodological guideline 56/2011 of the Ministry of Education, Science, Research and Sport of the Slovak Republic.

Further information and forms regarding the doctoral study (available at FEIT website: https://feit.uniza.sk/en/doctoral-studies/):

- Decision of the dean on the organisation and administrative provision for the third degree of study in the given academic year;
- Study plan of a FEEIT PhD. Student;
- Examination protocol of a FEEIT PhD. Student;
- Annual evaluation of a FEIT PhD. Student;
- Lists of study programme guarantors, members of field committee's working group, supervisors, course information sheets and further instructions, current information, and directives.

APPENDICES

APPENDIX No. 1

Course information sheets

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0E0E1	**Course name:** Basics of Research Practice (ZVP)
Selectiveness: Compulsory; **Completion**: Exam	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 2.0 Seminars: 0.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Lectures: lectures with problem-based components, interactive lectures with discussions, lectures with multimedia elements, interviews, and consultations with feedback.
Number of credits: 10	
Study workload: 300 hours; 2h*13 (a present form of education) 100h (project preparation – drafting a paper for publication) 74h (consultations regarding the preparation of the paper) 100h (self-study)	
Recommended term of study: 1. year, winter semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: - Co-requisites: -	
Course requirements: **Continuous assessment/evaluation:** Students deal with scientific papers covering the area of the dissertation and prepare their own scientific paper for publication and its defense in front of the scientific community (the experts), which, together with other activities, will be evaluated by the scientific committee during the oral examination. **Final assessment/evaluation:** The examination consists of an oral dispute on the prepared paper. The specific way of assessment of students' work during the semester and the examination will be specified at the beginning of the semester by the course teacher. The final evaluation of the students' study results resulting from the completion of the subject follows Articles 8 a 9 of the Study Regulations for the Third Degree of University Study at the University of Žilina. The minimum score for registration for the exam is not specified.	

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
Scientific paper for submission	40	Professional knowledge, working with information, teamwork, and presentation skills
portfolio	10	Professional knowledge, working with information, independent and teamwork
Examination	50	Professional knowledge, presentation skills

Course outcomes:
Students can handle publication databases, from which they can obtain relevant information, publications, and resources for further application within their dissertation. Students can analyse information obtained by the study of scientific resources, they can evaluate and select important facts and assess relevant connections in terms of dissertation objectives.
Students will be able to formulate their own conclusions and hypotheses using the obtained knowledge. They will analyse the data from research activities, namely independent research work and scientific research activities in the research team aimed at confirmation of the stated hypotheses. They design and present research reports.
Students can create their own scientific papers for submission and defend them in front of the scientific community (the experts).
Students can independently present the results of their own scientific and research activities, as well as the activities of the research team.

Course scheme:
Sources to obtain relevant information for scientific research activities. Nature and structure of modern science. Scientific and non-scientific methods – types and characteristics. Methods of collection of scientific information. Methods of processing and evaluation of scientific information. Research process and its stages. Types of research and design of research project. Ethics of scientific work and presentation of its outputs.

Recommended literature:
[1] Kumar, R: Research methodology: A step-by-step guide for beginners, SAGE, 2014.
[2] Hulín I et al.: Úvod do vedeckého bádania. Slovak Academic Press Bratislava, 2003, 553 p.
[3] Hanáček J, Javorka K a kol. Základy vedecko-výskumnej práce. Príručka pre doktorandov a mladých vedeckých pracovníkov. Osveta Martin, 1. issue, 2008.

Instruction language: Slovak

Notes:

Course evaluation:
Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers:

Last update: 2022-07-29 08:50:56.430

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0E012	**Course name:** Foreign Language (SvJ)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*****:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	guided discussion/interviews/colloquium utilizing direct method/peer learning/buzz groups; presentations; simulations of real foreign language environment; continuing oral and/or written knowledge assessment; feedback
Number of credits: 10	
Study workload: 300 hours; Study workload: 300 hours; 200h (consultations + exam) 100h (self-study)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Active participation in language learning in the scope of two semesters. During this period, the student is to complete the following duties (activities) related to the issues addressed in his/her dissertation:

– preparation of a scientific article in a foreign language in the required format.

– preparation and delivery of a professional presentation.

Both activities will be summarised by percentage (0 – 100%). The percentage obtained for successful completion of language learning reflects the quality of knowledge and skills acquisition in accordance with the learning objective.

Final assessment/evaluation:

An oral examination before a committee consists of a "presentation of a professional text" part and a "conversation regarding professional and specialised topics" part. For the final evaluation of the World Language course, the committee also takes into account the percentage of success in language learning. The final course evaluation is governed by Directive No. 110 Study Regulations for the Third Degree of the University Study at the University of Žilina.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
Successful completion of language education	40	presentation skills, language productive skills, independence, creativity, dealing with professional texts
evaluation by the state examination committee	60	professional knowledge; professional text handling, presentation skills; information handling; independence

Education outcomes:

English for Specific Purposes education aims at the student's intentional acquisition of new linguistic competencies in the field of so-called soft skills together with the development of vocabulary in the thematic areas of theoretical electrical engineering. In the language learning process, the student develops and reinforces existing linguistic competencies and simultaneously acquires those relevant to academic practice within the study programme context.

The student can effectively use linguistic means to express attitudes, present his/her own conclusions, and formulate ideas, arguments, and scientific conclusions in the world language.
The student is familiar with and uses academic and professional presentation and writing techniques during his/her study in the relevant study programme. The student can correctly reinterpret a professional text in a world language and independently prepare his/her own text based on the results of scientific research. The student shall be able to actively participate in teamwork and simultaneously independently present respective findings and/or conclusions at various international events, including conferences.

During the foreign study stay, the student shall be able to perceive the cultural differences between the home and host country and the acquired knowledge, skills and strategies will enable him/her to act expertly at an international level.

Course scheme:

Active participation in language education in the scope of two semesters (1st and 2nd study semester). During this period of study, the student is to complete the following duties (activities) related to the issues addressed in his/her dissertation:

– preparation of a scientific article in a foreign language in the required format.

– preparation and delivery of a professional presentation.

2. Content processing of approx. 100-150 pages of professional text related to the topic of the dissertation (determined in cooperation with the supervisor), presentation of the acquired knowledge in the world language during the examination in the scope of up to 15 minutes.

3. Preparation for conversational topics corresponding with the professional text and specialized topics on which the doctoral student will give his/her opinion in the examination discussion:

– Topic of my dissertation.

– Characterization of my workplace.

– Doctoral study in my field of study.

– Current state and global trends in the field of my dissertation.

– Opportunities to study abroad.

Recommended literature:

[1] 100-150 pages of the professional text prescribed by the supervisor according to the topic of the dissertation within the doctoral student's specialization.

[2] Professional literature recommended by the supervisor in the selected world language.

Instruction language: Slovak/English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers:

Last update: 2022-08-23 13:30:57.563

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0E003	**Course name**: Selected Chapters from Mathematics (VSM)
Course selectiveness: Compulsory Elective; **Course ending:** State exam	
Profile course: - **Core course:** yes	
Form, extent and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars or clinical practice	Lectures: 2.0 Practical classes 0.0 Lab exercises 0.0
Methods by which the educational activity is delivered	Present form of education
Applied educational activities and methods suitable for achieving learning outcomes	Lectures: lectures implementing problem-solving methods, interactive lectures with discussion, lectures with multimedia support, discussion, consultancy with feedback.
Number of credits: 10	
Study workload: 300 hours; 2h*13 (on-site education) 100h (project based learning) 74h (consultancy on project) 100h (self-study)	
Recommended semester/term of study: summer, 1. year	
Study degree: 3	
Required subsidiary courses: Prerequisites: - Co-requisites: -	

Course requirements:

Continuous assessment / evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow the requirements of their supervisors and course teacher. Project results will be presented during the oral examination in front of the committee.

Final assessment /evaluation:

The concrete way of assessment of the work in the semester and examination will be specified at the beginning of the semester by the teacher of the subject.

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

Forms and methods of assessment	Predetermined weight %	Area of knowledge, skills and competence
1 implemented project assignment	40	Professional knowledge, work with information, independence
1 presentation	10	Work with information, individual and team work, discussion abilities
Oral examination	50	Professional knowledge, presentation skills

Course outcomes:

Students can analyse information acquired by studying applied mathematics from professional publications. Students are able to asses, to select important facts and to evaluate relevant connections according to the dissertation thesis.

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and required mathematical calculations.
Student can individually present results of their assignment in front of professional public in accordance to the dissertation thesis objectives.

Course scheme:
1st range of topics - Mathematical analysis: Integral calculus, Functions of complex variable, Functional series, Integral transformations, Ordinary differential equations, Partial differential equations, Eigenfunctions of linear differential operators, Functional analysis, Vector analysis, Special functions.
2nd range of topics – Algebra: Algebraic equations, Linear algebra, Linear transformations, Matrix analysis.
3rd range of topics – Possibility theory, Mathematical statistics: Theory of random events and processes, Regression and correlation, Theory of stochastic processes, Markov's processes.
4th range of topics – Numerical analysis: Partial differential equations, Numerical solution of partial differential equations, Ordinary differential equations, Numerical analysis of ordinary differential equations.
5th range of topics – Discrete mathematics: Graph theory, Theory of difference equations, Mathematical logic, Fuzzy logic, Numbers theory, Coding theory.
5th range of topics – Others: Tensor calculus, Mathematical modelling of dynamic systems, Mathematical programming and algorithms.

Literature:
Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:
Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers:
Lecture: doc. Mgr. Branislav Ftorek, PhD.

Last updated: 2022-03-16 12:21:16.923

The person responsible for the course: doc. Mgr. Branislav Ftorek, PhD.

Approved by: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE03	**Course name:** Electric drives and electric traction (EPET)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*****:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

The final course evaluation is governed by Directive No. 110 Study Regulations for the Third Degree of the University Study at the University of Žilina.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Selected chapters from electric drives: Dimensioning of power parts of electric drive, Control of DC electric drives, Control of AC electric drives, Control of special electric drives with stepper motor, switched reluctance motor, synchronous reluctance motor and BLDC motor.
2. Selected chapters from control theory: Control in frequency domain, Control of linear systems in time domain state control, Linearization of feedback on control of nonlinear systems, Observers of state and fault quantities, Discrete control, Logic control.
3. Modern methods of electric drive control: Robust control of electric drives, Control of systems with variable structure, Use of fuzzy logic for control of electric drives, Applications of neural networks in control of electric drives, Sensorless control in the field of zero, low and high speeds, Control of self- sensing ”engines.
4. Electromechanical systems: Description of kinematics and dynamics of electromechanical systems, Methods of adaptive (on-line) identification of electric drive parameters, Methods of statistical identification using pseudorandom signals, Identification of systems using neural networks.
5. Selected chapters from controlled drives: Design of drive control for static accuracy and dynamics, cascade and parallel control structure, Regulation of AC drives, Adaptive and optimal control el. drives.
6. Drive complexes (multi-motor drives and servosystems): Mathematical models of continuous line subsystems with flexible and plastic coupling, Simplification of mathematical models of complex systems, Analysis of multi-motor drives in frequency domain and state space, Autonomy and invariance of systems with multiple inputs and outputs (MIMO), Design methods for technological controllers of multi-motor drives.
1. Dynamics of electric traction,
2. Energetics of electric traction.
3. Traction drives and their control: Properties, construction and regulation of DC, synchronous, asynchronous, and special traction motors. Vector control of traction drives with synchronous and asynchronous motors. .
4. Electric traction equipment of urban public transport: Trolleybuses, trams, urban expressways, unconventional railways, public transport energy.
6. Electrical power transmission of motor vehicles: Properties of internal combustion engine, power, power regulation, fuel consumption, Traction generator, control scheme, Unidirectional, alternating and mixed transmissions, Type power of engine and generator, traction characteristics.

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Tewari A.: Modern Control Design with Matlab and Simulink, John Wiley and Sons Ltd., New York 2002, ISBN 0 471 496790.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: doc. Ing. Pavol Makyš, PhD.

Last update: 2022-03-22 14:03:34.060

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE04	**Course name:** Electrical machinery and equipment (ESaP)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

Basic types of electrical machines (transformers, unidirectional machines, asynchronous machines, synchronous machines) and their operating characteristics: Spare schemes and investigation of their elements (measurement and calculation), induced voltage, phasor diagrams of alternating electric machines, analysis of no-load, short-circuit and load conditions , characteristics and method of their measurement, losses, efficiency, energy and power flows.

Solution of transients in electrical machines using the general theory of electrical machines. Mathematical methods and simulation models for the investigation of transients of electrical machines, interpretation of results, stability analysis of electrical machines.

Transformation between different reference frames (Transformation of 3-f system to 2-f according to Park, transformation of rotating coordinates to stationary, transformation of asymmetric systems by decomposition into symmetric components).

Solution of electromagnetic fields of electrical machines and design methods el. Machines. Finite element method (FEM) in the analysis of the electromagnetic field of an electric machine. Solution of magnetic circuits of a machine with permanent magnets. New methods and materials used in the design of electrical machines.

Thermals and ventilation of electrical machines. Solution of thermal fields.

Non-harmonic power supply of electrical machines. Influence of higher harmonics on the properties of electrical machines, on losses, noise and warming of electrical machines.

Measurement and testing of electrical machines. Implementation of measurement methods and tests, measuring instruments used in conjunction with computer technology, automated measurement system on electrical machines.

New and non-standard types of electrical machines. Construction arrangement, replacement diagrams, phasor diagrams, simulation models and analysis of properties in steady and transient states of these electric machines: Electric machines with permanent magnets, stepper motors, brushless motors, switched reluctance machines, reluctance synchronous machines, linear and disk motors.

Switching processes: Ideal and real switch, switch-trip circuit interaction, recovered voltage, current zero phenomena during tripping, tripping of DC circuits

Thermal and dynamic stress: Heat sources in electrical devices, heat balance, basic equation of heat conduction and its solution, solution of thermal fields using FEM, consideration of material change, influence of short circuit current on thermal and dynamic stress, solution of magnetic fields and dynamic forces at short circuits, design of parts of the current path and extinguishing system.

Electric discharges: electric arc, mathematical formulation of electric arc, energy balance of tripping arc in devices, extinguishing systems.

Contacts of electrical devices: Phenomena on electrical contacts, contacts, contact materials and their properties, erosion of contact material, effect of tripping arc on contacts.

Modeling and simulation: use of simulation methods in electrical devices, solution of switching processes, solution of thermal and magnetic fields.

Measurement and testing of electrical devices: Measurement in the field of current zero, sensing and registration of characteristic values of the switching process (current, voltage, pressure, energy, etc.), use of computer support in data registration and processing, test methods (switching capacity, durability, measurement characteristics, etc.).

New principles and constructions of electrical devices: Circuit breakers, electronic releases, surge arresters, protectors, LV, MV and MV switches..

Recommended literature:

Based on a selected range of topics and dissertation objectives.

1. Juha Pyrhonen, Tapani Jokinen, Valéria Hrabovcová: Design of Rotating Electrical Machines, 1st

Edition 2008, ISBN 978-0-470-69516-6, 2nd Edition 2014, ISBN 978-1-118-58157-5, (Návrh točivých elektrických strojov), John WILEY and Sons, Ltd, UK, United Kingdom, str.: 584,
2. Bianchi N.: Electrical Machines Analysis Using Finite Elements. CRC Taylor & Francis, London 2005, ISBN 0-8493-3399-7.
3. Charles I. Hubert: Operating, Testing and Preventive Maintenance of Electrical Power Apparatus, ISBN 0130417742, 2002

Instruction language: English

Notes:

Course evaluation:
Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Pavol Rafajdus, PhD.

Last update: 2022-03-22 14:03:43.027

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE05	**Course name:** Electromagnetic compatibility (EMK)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Electromagnetic compatibility, basic concepts and relevant standards. EMC chain, characteristics of its parts. Electromagnetic interference and susceptibility.
2. Sources of interfering signals and their classification. Distribution of interference sources and mechanisms of transmission of interfering signals. Galvanic, inductive and capacitive coupling. Radiation bond. Methods and means for suppressing interfering signals.
3. Power electronic system as an EMC object. Generation of interfering signals in power electronic systems (VES) and their propagation. Problems of electromagnetic interference and susceptibility of VES.
4. Overvoltages in VES, origin, negative effects and basic principles of protection. Classification of surge sources, dynamic characteristics and their energy content. NEMP and LEMP, origin and protection against them. Surge protection, distribution, principle of operation and application area.
5. Means to reduce negative electromagnetic interference. Chokes, capacitors and filters. Magnetically coupled filters. Electromagnetic shielding and its application. Active methods of elimination of negative electromagnetic interferences, controlled commutation process, soft commutation.
6. Negative effects of VES on the supply network, interfering terminal voltages, interfering magnetic and electromagnetic fields, suppression options. VES to improve the quality of el. energy in the supply network. Compensators and active filters.
7. Modeling, simulation and experimental measurement of interfering electromagnetic fields. EMC VES analysis. 3D analysis tools - comsol / femlab. Means for measuring interfering signals and fields. Measuring methods.

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Pavol Špánik, PhD.

Last update: 2022-03-22 14:03:49.840

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE06	**Course name:** Physics (F)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

Electrostatic field in vacuum and in the material environment.
Magnetic field in vacuum.
Magnetic field in the material environment.
Electromagnetic induction.
Electromagnetic waves.
Basic concepts of thermals and thermodynamics.
Thermal radiation.
Atom construction.
Band structure of energy levels of metals, semiconductors and insulators

Recommended literature:

Based on a selected range of topics and dissertation objectives.
1. A. Tirpák: Elektromagnetizmus, Vyd. Polygrafia SAV , 1999
2. A. Beiser: Úvod do moderní fyziky, Academia Praha, 1975
Doplnková literatúra:
1.P. Bury a kol. Fyzika 1, EDIS Žilina, 2013

Instruction language: English/Slovak

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Dušan Pudiš, PhD.

Last update: 2022-03-22 14:03:57.590

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE07	**Course name:** Programming (PG)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*****:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Creation of control programs for microcomputers and DSPs in higher programming languages: ...- possibilities of microcomputers, DSP for use in control of power semiconductor systems - creation of flow charts - transcription of a mathematical model into the program code of a microcomputer system ...- criteria for selecting the sampling period
2. Differences between control and simulation programs; creation of control programs for real-time applications with closed feedback loops
3. Creation of simulation programs for the analysis of continuous and discrete dynamical systems; transcription of a continuous mathematical model into a discrete state space; numerical integration methods; criteria for selecting the integration step
4. Creation of program projects; object-oriented programming; multilevel simulation programs using mathematical equation description of dynamic system (eg MatLab, Plex), circuit simulator (OrCAD) and 2D and 3D programming environments (Comsol, FEMLab)
5. Work in dSpace programming environment using MatLab / Simulink libraries, toolboxes and real time unit
6. Presentation of own program, designed for application related to the topic of the dissertation; comments on commands and program blocks, control loops; trial the program with the application (virtual or real)

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: doc. Ing. Pavol Makyš, PhD.

Last update: 2022-03-22 14:04:07.820

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE08	**Course name:** Theory of automatic control (TAR)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*****:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Application of mathematics in control circuits, integral transformations.
2. Block diagrams.
3. Nyquist criterion, its use for typical open loop transmissions.
4. Other methods of open loop function analysis.
5. Influence of noise and disturbances on the output.
6. Transient characteristic analysis methods.
7. Nonlinear systems
8. Variable structure systems

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: doc. Ing. Anna Simonová, PhD.

Last update: 2022-03-22 14:04:15.510

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE09	**Course name:** Power electronics (VE)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Semiconductor materials and components
2. Perspective topologies of the main circuit of power semiconductor converters
3. Origin of power loss in the elements of the main circuit and methods of its reduction.
4. Progressive switching techniques and methods of energy flow control
5. Problems of converters with high switching frequency.
6. Components, progressive topologies and control methods.
7. Excitation, protection and commutation circuits of power semiconductor converters.
8. Power semiconductor converter control methods.
9. Environmental aspects of the application of power semiconductor converters

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Mohan, N., Undeland, T.M., Robbins, W.P.: Power Electronics: Converters, Applications and Design (3rd Edition). Wiley Publisher, New York, 2003.

BALIGA, B. Y. : Modern power devices. John Wiley & Sons, New York, 2007

Luo, F.L., Ye, H.: Power Electronics – Advanced Conversion Technologies. CRC Press, Boca Raton (USA, FL), 2010

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Pavol Špánik, PhD.

Last update: 2022-03-22 14:04:22.560

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE10	**Course name:** Power semiconductor systems (VPS)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*****:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. State analysis of power semiconductor systems - linear, linearized and non-linear VPS
2. Behavior and prediction of state variables in dynamic states using z-transform, Clarke and Park transform
3. Spatial vector modulation of output voltage of voltage converter systems
4. VPS control subsystems
5. VPS applications in: - power supply systems (SMPS - all types) - industry - converter drives - electric traction (SIM rectifiers, electric vehicle drives, multilevel converters) - power engineering (PV inverters, compensation converters - all types (SVC, PAF, SAF, UPFC, DVR, ..), HVDC transmissions with current converters and 4QC converters)

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Luo, F.L., Ye, H.: Power Electronics – Advanced Conversion Technologies. CRC Press, Boca Raton (USA, FL), 2010, ISBN 978-1-4200-9429-9.

Doplnková literatúra:

Mohan, N., Undeland, T.M., Robbins, W.P.: Power Electronics: Converters, Applications and Design (3rd Edition). Wiley Publisher, New York, 2003.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Michal Frivaldský, PhD.

Last update: 2022-03-22 14:04:40.710

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE13	**Course name:** Smart grids (IS)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Main features of Smart Grids.
2. Distributed generation.
3. E-mobility.
4. Smart Grids.
5. Smart metering systems.
6. Economic aspects.
7. The use of Big Data and Artificial Intelligence for Smart Grids.

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Peter Braciník, PhD.

Last update: 2022-04-25 10:59:36.147

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE14	**Course name:** Power quality (KEE)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. EMC.
2. The asymmetry of three-phase system.
3. Harmonic components of current and voltage in the power system.
4. Flicker effect.
5. The powers in the electric power system.
6. Voltage dips and interruptions.
7. The ways and means of connecting devices to the network with the desired quality parameters and conditions for their connection to the network.
8. Methodology for measuring and complex evaluating of power quality.
9. Power quality compensation.
10. Modelling and simulation of power quality issues.

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Alena Otčenášová, PhD.

Last update: 2022-03-22 14:04:56.170

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE15	**Course name:** Power systems modelling (MPES)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Methods for solving large-scale linear systems (direct, iterative) used for modelling of power systems.
2. The method to solve static load-flows and used algorithms.
3. Dynamic modelling of power system elements and power system operation.
4. Methods used for fault analysis.
5. Methods of models' parameterization, model parameters' calculation from technical data.
6. Software tools for static and dynamic modelling of power system operation.

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: doc. Ing. Marek Höger, PhD.

Last update: 2022-03-22 14:05:03.670

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.

Higher education institution: University of Žilina	
Faculty: Faculty of Electrical Engineering and Information Technology	
Course ID: 3D0DE19	**Course name:** Power systems control (RPES)
Selectiveness: Compulsory; **Completion**: Examination	
Profile course: - ***Core course*****:** -	
Form, extent, and method of teaching activities:	
Number of classes per week in the form of lectures, laboratory exercises, seminars, or clinical practice	Lectures: 0.0 Practical classes 2.0 Lab exercises 0.0
Methods by which the educational activity is delivered	The present form of education
Methods for achieving learning outcomes	Seminars: controlled discussion, explanation, project-based learning, self-study with electronic resources, experiment, simulations, programming, question-answer method, project work
Number of credits: 10	
Study workload: 300 hours; 2h*13+0h*13+0h*13 (on-site education) 100h (self-study) 174h (project based learning)	
Recommended term of study: 1. year, summer semester	
Level of study: 3	
Required subsidiary courses: Prerequisites: Co-requisites:	

Course requirements:

Continuous assessment/evaluation:

Students complete an individual project in which they process selected topics from the course scheme based on the objectives of their dissertation theses. They will follow of their supervisors and course teacher/s. Project results will be presented during the oral examination in front of the committee..

Final assessment/evaluation:

Article 9 of UNIZA Directive no. 110, The Study Regulations for the third degree of university studies at the University of Žilina, specifies the final assessment by the mark.

The minimum score for registration for the exam is not specified.

Forms and methods of assessment	Predetermined weight %	Field of knowledge, skills, and competencies
1 implemented project assignment	35	Professional knowledge, work with information, independence
1 presentation	15	presentation skills
Oral examination	50	Professional knowledge

Education outcomes:

Students can critically assess and select methods suitable for the solution of a problem and tasks defined in the semester assignment.
Students demonstrate the application of selected methods in the design of simulation models and calculations.
Students evaluate obtained results and implement them in the scientific paper.
Students formulate a project text that will be applied within their dissertation theses.
Students can present the output of their works.

Students, based on obtained knowledge, can assess and explain the efficiency of the application of selected methods in terms of their dissertation theses.

Course scheme:

1. Technical and economic aspects of power system operation.
2. Control of electricity generation.
3. Frequency and active power control.
4. Voltage and reactive power control.
5. Demand side management.
6. Energy and distribution management systems, distribution automation.
7. New trends in power distribution system management.
8. Electromobility and its impact on the power system operation.
9. New approaches to the power system operation based on the application of Big Data, Artificial Intelligence and the Smart Grid concept.

Recommended literature:

Based on a selected range of topics and dissertation objectives.

Instruction language: English

Notes:

Course evaluation:

Total number of evaluated students: 0

A	B	C	D	E	FX
0 %	0 %	0 %	0 %	0 %	0 %

Course teachers: prof. Ing. Peter Braciník, PhD.

Last update: 2022-03-22 14:05:11.123

The person responsible for the course: prof. Ing. Pavol Špánik, PhD.