Electrical Engineering, professional undergraduate study
-learning outcomes-

1st semester

285394 Physics * 6.0 ECTS

1. write kinematic equations and apply them to a horizontal and oblique shot. explain newton's laws on the example of one or more connected bodies. mathematically formulate the equations of motion on a horizontal and oblique surface for one or more connected bodies. (level 5, 1 ects)
2. explain the laws of conservation of energy and momentum on the examples of elastic and inelastic collisions, and on the examples of sliding with friction and energy dissipation. compare the physical description of the world using conservation of energy with the description of the world using newton's laws. apply the learned laws to concrete tasks and examples. (level 6, 1 ects)
3. calculate the center of mass of a given body, calculate the moment of force and the moment of inertia with respect to the principal axis of rotation. formulate the equations of motion of a rigid body in rotation. (level 5, 1 ects)
4. determine the difference between forces and pseudoforces. distinguish between inertial and accelerated systems. (level 6, 1 ects)
5. formulate equations relevant to fluids at rest and in motion. explain the origin of the buoyancy force, the meaning of the continuity equation, and the manifestations of bernoulli's equation in fluid flow. (level 5, 1 ects)
6. solve the equation of an ideal harmonic oscillator for the case when the oscillator is in equilibrium at t=0 and for the case when it is in maximum elongation at t=0. write an expression for the total energy of the oscillator. distinguish between types of oscillators. (level 5, 1 ects)

285397 Programming and Algorithms* 5.0 ECTS

1. formulate and analyze basic concepts in programming — algorithm and its presentations and three basic program structures: sequence, selection, iteration. [complexity level 5, 1 ects.] 2. write and interpret the definition and task of programming languages, discuss their basic types and argue syntactic determinants and basic types of expressions of the selected programming language (c/c++) in procedural programming: directives, statements, functions. list and analyze the phases in writing and executing a program. apply the above knowledge in work in selected programming environments during practical programming. [complexity level 6, 1 ects.]
3. in the chosen programming language (c/c++), formulate and classify: 1) existing data types,
2) operators, and 3) statement types for controlling program execution: i) for organizing a block of statements (sequence programming structure), ii) for implementing conditional statements (selection programming structure), iii) for implementing program loops (iteration programming structure). [complexity level 5, 1 ects.]
4. be able to analyze given programming tasks, identify and select algorithms necessary for their solution, implement them in the chosen programming language in the form of procedural computer programs with a console interface, and then critically evaluate them. [complexity level 6, 1 ects.] 5. create software solutions for solving problems of filtering (input) data, for statistical analysis, and for problems of searching and sorting data. [complexity level 6, 1 ects.]

2nd semester

285405 Engineering methods and statistics * 5.0 ECTS

1. organize and propose basic technical data in order to draw conclusions in an engineering

context, (Level 5, 1 ECTS).

2. recommend basic methods of numerical calculation, modeling and visualization of data in the context of electrical engineering problems (Level 6, 1 ECTS).

3. measure and present data using a frequency table. Understand the relationship between clustering and dispersion of data around the mean. Calculate standard deviation (Level 6, 1 ECTS).

4. relate empirical and theoretical data distribution. Relate theoretical distribution and "a priori probability". Define independent events and know the formulas for adding and multiplying probabilities (Level 5, 1 ECTS).

5. apply Bernoulli's formula in product control. Relate Poisson's formula to the Bernoulli formula in the case of a large number of data. Distinguish between continuous and discrete variables. Compare Binomial and Gaussian distributions. (Level 6, 1ECTS)

6. measure the values of the dependent variable (y) for a selected set of values of the controlled variable (x), and calculate the correlation coefficient. Interpolate a line through a given set of points (x,y). Relate correlation and causality. (Level 6, 1ECTS)

285404 Computer communications and networks* 5.0 ECTS

1. analyze and identify the basic principles of functioning of computer communication systems and computer networks, according to the layers of reference network models and specific communication protocols contained in the TCP/IP stack - ARP, ICMP, IP, TCP, UDP (4th level, 1 ECTS credit)

2. determine and evaluate the role and application of the studied communication protocols in the usual use of local networks and the Internet - from access devices and networks, topology and structure of the basic network, specialized network devices to the application of specialized software (6th level, 1 ECTS credit)

3. plan, design and build test computer networks, using available network equipment or the specialized emulator system Imunes, (7th level, 1 ECTS credit)

4. measure (record) management information in built networks, determine the functional principles of the used network protocols by using auxiliary programs such as ping, traceroute, netcat, nslookup (6th level, 1 ECTS credit)

5. review and determine possibilities of applying acquired knowledge in practice and in specialized courses of the senior year - IoT, web programming (6th level, 1 ECTS credit)

3rd semester

129716 Mobile Applications * 3.0 ECTS

1. independent development of a simple application for the Android mobile platform
2. independent use of the Android Studio and Android SDK development tools
3. ability to make decisions for the use of a specific mobile platform
4. creation of simple user interfaces for native Android applications
5. independent development of simpler native Android applications
6. ability to adapt to development for other mobile platforms (conceptually)
7. ability to apply acquired knowledge in practice and in professional courses in higher years
8. implementation, documentation and presentation of own Android applications

129719 Choice from other HEI – 3rd semester * 3.0 ECTS

4th semester

129740 Choice from other HEI 1 – 4th semester * 3.0 ECTS

129741 Choice from other HEI 2 – 4th semester * 3.0 ECTS

5th semester

129743 Automation of Machines and Devices* 3.0 ECTS

1. understand the requirements for making electrical appliances scheme from the problem description, for simpler work processes
2. select the necessary electrical components from the requirements for the creation of control automation, for simpler work processes
3. to understand the functioning of the control automation from electrical diagrams
4. discuss the basic components incorporated in different versions of control automation
5. independently create electrical schemes for power supply and control of simpler machines and devices
6. to present ways of logical thinking for creating schemes and monitoring the flow of current through lines electrical schemes
7. understand the basic functions of programmable logic controllers (PLCs), text display connected to PLC and programmable relays

129745 Electric Power System Analysis* 4.0 ECTS

1. introduction to the electric power system
2. formulation of theoretical calculations of individual parts of electrical installations
3. selection and dimensioning of the necessary equipment for the functionality of electrical installations
4. recognition of schemes of medium, high and very high voltage electrical installations
5. maintenance of electrical power installations
6. testing the functionality of electrical power installations
7. detailed calculation of short-circuit currents of a part of an electrical power installation
8. assessment of the quality of electrical power supply
9. understanding the functioning of electrical engineering and power systems

129748 Power Electronics* 5.0 ECTS

1. understand the operation of basic power electronics components and their combinations
2. describe the operation of different types of rectifiers,
3. describe the operation of inverters (DC/AC converters)
4. describe the operation of different DC/DC converters
5. describe the operation of AC/AC (direct and indirect) converters
6. interpret the acquired knowledge about the use of different types of converters
7. consider the application of converters for controlling DC and AC electric motor drives

6th semester

129764 PLC Control Systems* 3.0 ECTS

1. understand the requirements for creating a program for PLC from the technological description of the problem
2. create a program flow chart from the technological description of the process
3. independently create simpler application programs
4. test and bring to functionality independently created simpler application programs,
5. report on the possibilities offered by system control using PLC, for various applications
6. apply the skill of logical thinking and following the sequence of the program line by line
7. demonstrate the possibilities of influencing the flow of the application program using the operation panel

129765 Computer Networks* 4.0 ECTS

1. acquisition of sufficient theoretical knowledge in the field of computer networks, according to OSI and TCP/IP reference model
2. knowledge and understanding of facts related to communication security
3. independent performance and resolution of specific problems related to local networks
4. ability to work with equipment and software useful in network traffic analysis and resolution specific problems
5. application of communication equipment for the establishment of wired and wireless local networks
6. independent work on the analysis and presentation of assigned topics (writing technical/professional texts, drafting
graphic elements of the document and presentation, making and performing the presentation) – preparation for the final work
7. ability to apply acquired knowledge in practice and other professional courses

129769 Power System Protection* 3.0 ECTS

1. Introduction to the power system
2. Introduction to protection functions (overcurrent protection, differential protection, distance protection, voltage protection, etc.)
3. Introduction to types of protection relays and devices
4. Mastering parameterization, configuration and testing of protection devices.
5. Mastering the selection of the scope of protection for an individual facility in power engineering and industry.
6. Introduction to new directions in the development of relay protection.
7. Understanding the functioning of electrical and energy systems

129771 Power Electronic Devices* 3.0 ECTS

1. understand the methods of controlling power electronics converters
2. describe the possibilities of eliminating the influence of higher harmonics created by power electronics devices
3. compare the characteristics of available power electronics devices from different manufacturers, and
choose the appropriate device
4. apply the acquired knowledge about the use of converters in different areas
5. recognize the application of power electronics devices in unconventional power plants that use renewable energy sources
6. interpret the ways in which power electronics devices function in power plants that use renewable energy sources
7. independently research and find new achievements in the field of application of power electronics devices