

List of topics for the diploma exam

Field of study: **Electrical Engineering** Level of study: **Second-cycle studies**
 Area of Study (Specialization): **Microprocessor Control Systems in Electrical Engineering**

No.	Topics
1	Inheritance, encapsulation, and polymorphism in object-oriented programming [<i>Object oriented programming</i>]
2	Passive two-point synthesis [<i>Electrical engineering</i>]
3	Nonlinear DC and AC circuits and methods of their analysis [<i>Electrical engineering</i>]
4	Structures of rectifier systems with quasi-sinusoidal current [<i>Electronics and power electronics</i>]
5	Cogeneration system – principle of operation, efficiency, basic parameters, examples [<i>Renewable energy sources</i>]
6	Measurements of non-electrical quantities, methods, and assessment of measurement inaccuracy [<i>Electrical measurements of non-electrical quantities</i>]
7	Calculating forces and torques in linear and nonlinear electromagnetic systems [<i>Electromechanical propulsion systems</i>]
8	Electrical machines operation mode [<i>Electromechanical propulsion systems</i>]
9	Identification of remotely controlled measuring instruments via RS232C, USB, GPIB, LAN in the Windows system [<i>Electronic measuring systems</i>]
10	The idea of pipeline processing [<i>Microprocessor technology</i>]
11	Heat exchange methods [<i>Lighting engineering and electroheat</i>]
12	Digital filter designing methods [<i>Selected problems of signal processing</i>]
13	Methods of coupling electromagnetic interference [<i>Electromagnetic compatibility</i>]
14	Statistical methods of data analysis and presentation [<i>Statistical process control</i>]
15	Hydropower plants - types, role and tasks in the power system [<i>Generation of electric energy</i>]
16	Operation rules and application of evolutionary algorithms in optimization tasks [<i>Decision algorithms in the electric power engineering</i>]
17	Cybersecurity threats to ICT systems - classification and attack methods [<i>Cyber security and telecommunications in the power industry</i>]
18	Higher harmonics of currents and voltages - their essence, causes of formation, and their interference [<i>Disturbances in electric power systems</i>]
19	A method of measuring high DC voltage using a microcontroller [<i>Designing of measurement and control system</i>]
20	Partial discharges in electrical power devices - detection and location methods [<i>High voltage engineering</i>]
21	Digital Signal Processor Architectures [<i>Signal processors and embedded systems</i>]
22	Numerical notation formats in digital circuits [<i>Signal processors and embedded systems</i>]
23	Digital Signal Processing Algorithms [<i>Signal processors and embedded systems</i>]
24	Embedded System Architectures [<i>Signal processors and embedded systems</i>]
25	Development tools dedicated to digital systems [<i>Signal processors and embedded systems</i>]
26	Basic structures of grid inverters and control methods enabling the return of electrical energy to the AC grid [<i>Converter systems in RES</i>]
27	The structure and principle of operation of converter systems dedicated to cooperation with photovoltaic panels [<i>Converter systems in RES</i>]
28	MPPT algorithms in power electronic systems dedicated to cooperation with photovoltaic panels [<i>Converter systems in RES</i>]

29	Power electronic controlled current source - construction and principle of operation [<i>Converter systems in RES</i>]
30	Structure and functions of BMS systems used in energy storage [<i>Converter systems in RES</i>]
31	Aliasing and methods of its minimization in digital control systems [<i>Control of power electronics systems</i>]
32	Selected methods for determining the fundamental harmonic of the network voltage and synchronizing with it [<i>Control of power electronic systems</i>]
33	Differences between analog and digital control systems [<i>Control of power electronics systems</i>]
34	Example structure of a closed-loop control system for a converter using PWM pulse width modulation [<i>Control of power electronic systems</i>]
35	Types and example implementation of selected methods of pulse width modulation (PWM) [<i>Control of power electronic systems</i>]
36	Power electronic battery charger operating in CC and CV modes - high-current structure [<i>Converter systems in RES</i>]
37	Cascade control in the control system of a battery charger operating in CC and CV modes [<i>Converter systems in RES</i>]
38	Ways to communicate with IoT devices [<i>Internet of things</i>]
39	IoT Security [<i>Internet of things</i>]
40	Network communication protocols used in IoT [<i>Internet of things</i>]