**MINISTRY OF SCIENCE AND HIGHER EDUCATION**
**REPUBLIC OF KAZAKHSTAN**
**Branch of Anhalt University of Applied Sciences**
**«Anhalt International University in Kazakhstan»**

**«PPROVED»**
**Branch director**

**_____ Siemens Eduard**
**«___»_____2025**

# PASSPORT OF THE EDUCATIONAL PROGRAM
# 6B07126 -«Biomedical Engineering»

Head of the educational program Siemens Eduard

Almaty 2025

The OP has been developed on the basis of laws of the Republic of Kazakhstan and its normative documents: State obligatory standard of higher education (Order of the Minister of Science and Higher Education of the Republic of Kazakhstan from 20.07.2022g. № 2), Framework documents of operations of organisations of higher and postgraduate education (Order of the Minister of Education and Science of the Republic of Kazakhstan from 30.10.2018g. No. 595), Rules of organisation of credit-based educational process (Order of the Minister of Education and Science of the Republic of Kazakhstan from 20.04.2011 No. 152).

Educational program accredited as «Biomedizinische Technik» at University of Applied Sciences Anhalt (Germany) in Germany.

Passport data of EP 6B07126 - "BIOMEDICAL ENGINEERING"

Table 1

| № | Field name | Remark |
|---|---|---|
| 1 | Registration number | 6B07100360 |
| 2 | Code and classification of the field of education | 6B07 – Engineering. Manufacturing industries |
| 3 | Code and classification of training areas | 6B071 – Engineering and Engineering |
| 4 | Educational programs group | B064 - Mechanics and metalworking |
| 5 | Name of the educational program | 6B07126 – Biomedical Engineering |
| 6 | Type of EP | New;<br>(existing EP within the University of Applied Sciences Anhalt) |
| 7 | Goal of the EP | Training qualified specialists capable of developing, applying, and improving medical technologies that ensure diagnostics, treatment, and rehabilitation, integrating engineering solutions to enhance healthcare quality. |
| 8 | ISCED level | ISCED 6 bachelor's degree or its equivalent |
| 9 | НРК level | 6 |
| 10 | ОРК level | 6 |
| 11 | EP's specifications | Training in English; Upon completion of the training a diploma is awarded by the University of Applied Sciences Anhalt (Germany) |
| | Partner university (СОП) | In the course of the general agreement between University of Applied Sciences Anhalt and non-profit stocks company "Almaty University of Power Engineering and Telecommunications named after Gumarbek Daukeev" |
| | Partner university (ДДОП) | No; |
| 12 | List of competences | 1. Demonstrate critical thinking, independence and responsible behavior.<br>2. Analyze real practical problems, develop solutions and implement them using appropriate methods.<br>3. Demonstrate fundamental knowledge, methodological competence and professional skills that ensure broad scientific training.<br>4. Analyze and design electrical, electronic and biomedical systems and apply innovative solutions using modern methods of signal processing, automation, and digital and analog circuitry.<br>5. Apply knowledge of measurement technologies, including biomedical measurement techniques, to enable them to take measurements, evaluate errors, and analyze results.<br>6. Analyze complex technical and scientific problems, create mathematical and physical models, and apply appropriate modeling and optimization methods.<br>7. Demonstrate knowledge of anatomy, physiology, and the natural and engineering sciences, enabling them to solve interdisciplinary problems in biomedical engineering. |
| 13 | Learning outcomes | |

| | | |
|---|---|---|
| | | 8. Apply practical project management and quality assurance skills that enable them to carry out technical and scientific projects, document the work process and present the results.<br>9. Demonstrate the ability to work in a team, conduct research, learn independently, and have basic entrepreneurial and communication skills that prepare them for successful professional or scientific careers.<br>10. Apply knowledge of the design, modeling, and implementation of analog and digital circuits, including FPGA technologies and microcontroller systems, and apply these skills in practical applications.<br>11. Demonstrate competencies in information security, data protection and network communications, understand the principles of security and encryption and apply them in practical situations.<br>12. Apply methods of artificial intelligence and machine learning, apply them to solve problems, and also develop and implement corresponding algorithms using software.<br>13. Demonstrate practical skills in entrepreneurship, project management and legal frameworks, enabling them to work in interdisciplinary teams and analyse the ethical and economic aspects of engineering projects.<br>( Appendices No. 1 and No. 2) |
| 14 | Form of training | full-time |
| 15 | Language of instruction | English |
| 16 | Number of credits | 240 |
| 17 | Academic degree awarded | Bachelor of Engineering and Technology (Bachelor of Engineering) |
| 18 | Availability of an annex to the license for the direction of training | No |
| 19 | Availability of accreditation of the OP | Yes |
| | Name of accreditation body | **STIFTUNG Akkreditierungsrat** (The Foundation of the Accreditation Council) is a joint institution of the federal states of Germany responsible for quality assurance in teaching and learning at German universities. It holds the exclusive right to issue accreditation certificates to universities in Germany. It is a member of leading European and international quality assurance networks, such as the European Association for Quality Assurance in Higher Education (ENQA) and the International Network for Quality Assurance Agencies in Higher Education (INQAAHE). It is also listed in the European Quality Assurance Register for Higher Education (EQAR).); |
| | Accreditation validity period | The accreditation is valid for the period 1 April 2021 to 31 March 2029. |
| 20 | Information about disciplines | Information on disciplines UC /EC, GED, BD, PD (Appendices No. 2) |

**1. The structure of the educational program of higher education**

Bachelor's degree is a level of higher education aimed at training experts with the award of the academic degree of "Bachelor" within the relevant educational program, requiring the completion of no less than 240 academic credits.

The Biomedical Engineering (BMT) program builds on a broad background in science, engineering and economics to provide students with specialized knowledge, skills and methods in the field of biomedical engineering, especially in key areas such as medical devices, medical measurement technology and medical devices, and biomedical information technology. In addition, the methodological competence required for successful professional activities in the medical technology manufacturing and service industries, in hospitals, in certification and supervision bodies, in the planning and service of medical technology companies, as well as in the public sector or as an individual entrepreneur in design offices is developed. There is also an opportunity to strengthen professional skills and competencies through a mostly practical semester. This semester allows for on-the-job training or participation in projects as part of the research activities of the branch in Kazakhstan as well as at the base university in Germany or at industrial partners in the European Union. This supports the ability of graduates to apply scientific knowledge and methods in direct practical activities.

The content of the higher education program consists of courses from three cycles: general education disciplines (hereinafter – GED), basic disciplines (hereinafter – BD), and major (profiling) disciplines (hereinafter – PD). The structure is detailed in Appendices No. 1.

The GED cycle includes compulsory components (hereinafter – CC), university components (hereinafter – UC), and/or elective components (hereinafter – EC). The BD and PD cycles include both UC and EC disciplines. Additionally, there is a cycle of disciplines for additional types of training (hereinafter – ATT).

The GED cycle includes mandatory disciplines required by the branch of the foreign higher educational institution (Anhalt University of Applied Sciences, Germany).

The UC and EC are determined independently by the Branch, taking into account labor market demands, employer expectations, and the individual interests of students.

The credit load of the GED cycle at the Branch is no more than 10.4% of the total amount of the higher education program or 25 academic credits. Out of this, 20 academic credits are allocated, in accordance with clause 4 of article 65 of the Law of the Republic of Kazakhstan "On Education", to compulsory disciplines: "History of Kazakhstan", "Kazakh Language", and "Philosophy". In addition, the GED cycle includes UC disciplines - Business Administration module, which provides competences in economics and law, entrepreneurship and financial literacy.

The BD cycle includes the study of core academic disciplines and makes up no less than 47.1% of the total credit load of the higher education program, or no less than 113 academic credits.

The PD cycle includes core and profiling disciplines, as well as industrial practice, amounting to no less than 36,3% of the total volume of the higher education program, or no less than 87 academic credits.

In addition, for a possible internship at the parent University of Applied Sciences Anhalt (Germany), an additional discipline is offered - advanced study of technical German for 5 credits per semester.

The final certification (hereinafter – FC), including the preparation and defense of the bachelor's thesis, accounts for 6.3% or no less than 15 academic credits.

The modular curriculum complies with the requirements of the State Compulsory Standard of Higher Education and the structure of the higher education program includes all compulsory components and provides both university and elective components.

The modular program meets the minimum requirements for the number of credits in theoretical training – 210 credits, practice – 15 credits, and final attestation – 15 credits.

Timing and types of practices in the educational program are defined as: industrial practice - 8 semesters (15 credits), in addition, within the cycle of disciplines PD offers 2 practical modules

(non-technical and interdisciplinary project), as well as the list of EC offers a choice of practical modules.

The EC includes a wide range of both technical and non-technical modules for students to choose from.

**2. Catalog of elective disciplines**

The catalog of elective disciplines is formed for the entire period of study, taking into account the needs of the labor market and the educational program. In this case, the CED is not a static document - its content can be adjusted depending on: changes in the professional sphere and production needs; educational needs of students (on the initiative of a group of students, including at least one subgroup); the realization of academic mobility of teaching staff (faculty); the possibility of including in the educational process of modern professional courses developed by leading specialists and teachers of leading universities in the world.

The catalog of elective disciplines is developed and approved as an independent document regulating the selection and implementation of elective components of the curriculum - in Appendix No. 2.

**3. Modular curriculum**

The modular curriculum is presented in Appendices No. 2.

The effectiveness of learning outcomes is ensured through a comprehensive approach, where educational programs, curricula, and academic disciplines are all developed based on a modular principle.

The content and scope of each module vary depending on didactic objectives, the profile, and the level differentiation of students. The entire educational program is structured into autonomous organizational and methodological modules.

The formation and content of modules provide the necessary degree of flexibility and freedom for students in choosing their learning trajectory and acquiring specialized professional competencies that enhance their competitiveness in the labor market.

Modules of the educational program “Biomedical Engineering” are either compulsory, or university component, or variable for obtaining specific competences inherent to both a universal specialist of electrical engineering as well as a narrow specialist on the chosen trajectory (specialization).

**4. Trajectory selection method**

Up to the third year of study at the Branch, the modules are structured according to a “horizontal-vertical” scheme. The modules consist of compulsory, university, and elective components. The learning outcomes achieved after completing a module may vary depending on the chosen elective component within the module.

This scheme for forming the educational program provides students with the freedom to select disciplines listed in the Catalogue of Elective Disciplines and the modular curriculum. It ensures each student’s personal involvement in shaping their individual learning plan and includes the participation of academic advisors who assist students in choosing their educational trajectory.

As a result of implementing their chosen educational trajectory, students are expected to acquire the necessary competencies. The Individual Learning Trajectory (hereinafter – ILT) consists of compulsory (including the university component), elective, corrective, and organizational parts. The compulsory part includes core modules that align with the State Compulsory Standard of Higher Education. University components of the modules are mandatory regardless of the chosen trajectory and contribute to the development of fundamental "General Professional" and "Professional" competencies of future specialists.

The elective part consists of a selection of modules and their components that students choose for study according to their specific areas of interest. Both the compulsory and elective parts are aimed at defining the content of education.

The corrective part involves providing support to students in choosing disciplines within the elective modules, taking into account their individual characteristics, and in defining the

organizational part. The organizational part includes the following system components: forms, methods, technologies, tools, and control over the study of the chosen content. Table 1 presents the organizational components of the ILT.

Table 4.1 - Organizational component of ILT training

| **Elements of asynchrony** | Обеспечение асинхронности обучения | Средства, обеспечивающие асинхронность |
|---|---|---|
| 1. Independent work of students/ | Branch “Anhalt International University in Kazakhstan” | Working curriculum;<br>Timetable of classes;<br>Timetable of consultations of SRSP teachers;<br>Control over the fulfilment of the study plan |
| 2. Choice of disciplines of the variable component | Advisors, Tutors | Student's individual study plan |
| 3. Working on projects | Teachers | Individual study plan; Schedule of assignments, literature list, handouts, electronic resources |
| 4. Selection of an additional training profile | Students | Library, media library, electronic publications, Internet, syllabuses |

Table 4.2 shows the content component of learning, etc. The content component determines the options for the formation of individual educational technology. Within the framework of the educational program, it is possible to carry out academic mobility, receive additional education.

Table 4.2- The content component of ILT training

| ILT Options | Ensuring asynchronous learning | Tools that ensure asynchrony |
|---|---|---|
| Individual set of competencies | Students, advisors | Individual student curriculum |
| | Branch “Anhalt International University in Kazakhstan” | A set of variable disciplines |
| | | Working curriculum |
| Specification of the training profile (RGR, KR, research work, project work) | Students, advisors | Individual student curriculum |
| | Branch “Anhalt International University in Kazakhstan” | Approximate course work on the subject, calculation and graphic work on the subject, approximate research work on the subject |
| Individual level of discipline development (high, medium, low) | Students, advisors, teachers | Regulations on the point-rating system of assessment, schedule of tasks, research work |
| Professional adaptation to professional activity during the practice | Students, advisors, teachers, Branch “Anhalt International University in Kazakhstan” | Internship programs, contracts with enterprises on the bases of practices, the formation of individual assignments for practice, elements of dual training |
| Expanded set of professional competencies (selection of an additional training profile) | Students, advisors | Individual student plan |
| | Branch “Anhalt International University in Kazakhstan” | Non-linear schedule, the main educational program of additional training profile, professional training courses |

When selecting modules within the educational program the following key aspects were taken into account:

The program covers modules providing preparation for the main directions of professional activity of graduates.

Within the modules, along with the formation of professional competencies based on the study of applied examples, special attention is paid to the development of supraprofessional skills such as:

- problem solving;
- complex and systemic thinking;
- effective communication and teamwork;
- the ability to learn and develop independently;
- an understanding of social and ethical responsibility.

Compulsory project work allows students to master practice-oriented methods, promotes teamwork, build skills in solving complex problems and increases the overall effectiveness of the educational process.

The educational programs provide training of highly qualified specialists with a wide range of professional and supra-professional competencies in demand in various industries.

The structure of the educational program Biomedical Engineering reflects this approach and consists of several sequential stages:

Semesters 1–3: Courses aimed at developing civic identity, critical and philosophical thinking, and communication competencies necessary for successful professional and social integration are taught. These include mandatory disciplines such as History of Kazakhstan, Philosophy, and Kazakh/Russian language. In parallel, students study mathematics, natural sciences, programming fundamentals, algorithmic thinking, and the basics of electrical engineering and electronics.

Semesters 4–6: In-depth study of core disciplines and the introduction of specialized subjects that develop the key competencies of electrical engineers and IT specialists, regardless of further specialization.

Semester 7: In addition to core specialization subjects, students may choose three elective modules corresponding to their professional interests and providing advanced specialization. Students may also participate in interdisciplinary projects and study non-technical elective modules to develop soft skills.

The first year is characterized by a significant number of compulsory and university component disciplines within the modular curriculum. During the first three years, elective component courses are not included. However, the professional foundation is established from the first year, with a significant portion of the subjects dedicated to the theoretical foundations of electrical engineering and electronics. Scientific/technical English and German languages are intensively studied within the compulsory cycle. Upon completion of the first and second semesters, students will have earned 60 credits.

The second year continues the study of general education and basic disciplines. Students deepen their knowledge in their future professional field, complete 60 credits, and take an additional advanced German course in preparation for internships at the main campus of Anhalt University of Applied Sciences in Germany starting from the 5th semester and/or internships with the university's industrial partners in Germany.

The third year continues the study of basic disciplines, with an emphasis on the block of specialized disciplines of the university component. At the end of the third year, students complete 60 credits and continue their advanced German language course.

In the seventh semester, students complete the core specialization subjects and clarify their specific field of professional training. They undertake an interdisciplinary project and select three elective modules, including both specialized technical and non-technical modules (such as Business

Administration, Law, Quality Management, etc.). After completing the seventh semester, students will have earned 30 credits.

The eighth semester includes industrial practice and final attestation, totaling 30 credits. The industrial practice lasts at least 12 weeks, and the preparation and defense of the bachelor's thesis are allocated 10 weeks. These stages of the educational process are aimed at consolidating theoretical knowledge and developing practical skills necessary for solving professional tasks.

**The distribution of credits by modules and courses is presented in Table 4.3.**

Table 4.3 is a summary table reflecting the volume of loans disbursed by modules of the educational program.

| Course of study | Semester | Number of modules to be mastered | Number of subjects studied | | Number of credits KZ | | | | | hours | | Quantity | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CC | UC & EC | Theoretical training | Project activities | Production practice | Final certification | Total | Total in | ECTS | exam | differential test |
| 1 | 1 | 6 | 2 | 4 | 33 | 0 | 0 | 0 | 33 | 990 | 33 | 6 | |
| | 2 | 5 | 2 | 3 | 27 | 0 | 0 | 0 | 27 | 810 | 27 | 5 | 1 |
| 2 | 3 | 6 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 6 | |
| | 4 | 6 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 5 | 1 |
| 3 | 5 | 6 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 5 | 1 |
| | 6 | 6 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 5 | 1 |
| 4 | 7 | 6 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 6 | |
| | 8 | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 30 | 900 | 30 | FC | 1 PP |
| **Total** | | | **3** | **37** | **210** | **0** | **15** | **15** | **240** | **7200** | **240** | **36+ FC** | **5** |

*including elective disciplines containing project activities.

By developing additional modules in the university component of the program during the third and fourth years, it becomes possible to train specialists in a wide range of modern specializations, keeping pace with the times.

The educational program provides the application of an individual approach to students, ensures the transformation of professional competencies from professional standards and qualification standards into learning outcomes. Student-centered learning is provided - the principle of education, which implies a shift of emphasis in the educational process from teaching (as the main role of teaching staff in the "translation" of knowledge) to learning (as an active educational activity of the student). The educational program is designed to implement the principles of democratic nature of education management, expanding the boundaries of academic freedom and authority of educational institutions, which will ensure the training of highly motivated personnel for innovative and knowledge-intensive industries.

**Appendix №1**

Appendix 2 to the order
Minister of Education and Science
Of the Republic of Kazakhstan
dated May 5, 2020, No. 182
Appendix 1 to
the state the mandatory
standard of higher education

**The structure of the educational program of higher education**

| № | Name of cycles and discipline | Total labor intensity | |
|---|---|---|---|
| | | in academic hours | in academic credits |
| 1 | 2 | 3 | 4 |
| **1** | **Cycle of general education disciplines (GED)** | **750** | **25** |
| 1) | Compulsory component including: | 600 | 20 |
| | Modern history of Kazakhstan | 150 | 5 |
| | Philosophy | 150 | 5 |
| | Kazakh | 300 | 10 |
| 2) | University component | 150 | 5 |
| | Interdisciplinary Project: Business Administration | 150 | 5 |
| **2** | **Cycle of basic disciplines (BD)** | **3390** | **113** |
| 1) | University component and (or) optional component | 3390 | 113 |
| **3** | Cycle of profile disciplines (PD) | **2610** | **87** |
| 1) | University component and (or) optional component | 2160 | 72 |
| 2) | Professional practice | 450 | 15 |
| **4** | **Additional types of training (ATT)** | ***** | ***** |
| 1) | University component and (or) optional component | 750 | 25 |
| | Foreign language (advanced study of German) * | 750 | 25 |
| **5** | **Final certification (FC)** | **450** | **15** |
| 1) | Writing and defending a thesis, graduation project, or preparing and passing a comprehensive exam | 450 | 15 |
| **6** | **Total** | **At least 7200** | **At least 240** |

* Additional classes for advanced study of technical German.

**Appendix №2**

**Information about the disciplines studied and the competencies being formed**

| № | Name of disciplines | Cycle | Component | Number of credits | Brief description of the discipline | Learning outcomes (№) |
|---|---|---|---|---|---|---|
| 1 | Kazakh language | GED | CC | 5 | The course content includes the development of all types of speech activity and vocabulary work, work with authentic texts, mastering the language system, skills of written and oral communication in various spheres of life (social, domestic, educational and professional). | 1, 3 |
| 2 | Foreign language (technical scientific English) | BD | UC | 5 | The course develops proficiency in scientific and technical English for professional and academic contexts. Students master technical terminology, analyze specialized texts, and refine oral and written communication. They learn to discuss professional topics, interpret and adapt technical information, and critically evaluate specialized sources. | 1, 3 |
| 3 | Fundamentals of Electrical Engineering 1 | BD | UC | 8 | Electrical quantities and basic circuits. Series, parallel, and mixed connection of loads and sources. Methods for calculating linear circuits. Network transformations and bridge circuits. Operating point analysis with linear and nonlinear sources and loads. Electric fields, resistance, capacitance. Alternating current and voltage. Equivalent circuit parameters. First-order differential equations in electrical circuits. | 4, 6,10 |
| 4 | History of Kazakhstan | GED | CC | 5 | Examines historical events, processes and development of Kazakhstan from ancient times to the present. Formation of students' systematic understanding of their country's past, its culture, traditions and historical development. Studying the course through lectures, seminars, group and individual classes, as well as using sources and archival materials | 1, 9 |
| 5 | Advanced preparatory course for STEM subjects (Mathematics, Physics) | BD | UC | 5 | The course develops skills in equation solving, graph interpretation, data analysis, as well as logical and spatial reasoning. It covers the fundamentals of algebra, geometry, trigonometry, kinematics, dynamics, and electricity. The course fosters an understanding of physical principles and mathematical methods, emphasizing their practical application in engineering, programming, and scientific disciplines. | 1, 2, 6 |
| 6 | Foreign language (German) | BD | UC | 5 | The course is aimed at developing communication skills and practical competence in the use of a foreign language across everyday, socio-political, | 1, 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | professional, and academic contexts. Students will be able to express their thoughts fluently in both spoken and written forms in accordance with the language's norms, participate in dialogues and group discussions within the scope of the studied material, and reproduce and analyze the content of technical texts. | |
| 7 | Engineering Mathematics 1 | BD | UC | 7 | The course is aimed at equipping students with a broad spectrum of mathematical knowledge and developing their ability for both inductive and deductive reasoning, along with fostering mathematical intuition relevant to professional activities. The curriculum covers complex numbers, vector calculus, analytic geometry, conic sections, matrix operations, systems of linear equations, coordinate transformations, the principal axis theorem, differential calculus for functions of a single variable, and series expansions including Taylor series. | 2, 6 |
| 8 | Kazakh language 2 | GED | CC | 5 | The course content includes the development of all types of speech activity and vocabulary work, work with authentic texts, mastering the language system, skills of written and oral communication in various spheres of life (social, domestic, educational and professional). | 1, 3 |
| 9 | Philosophy | GED | CC | 5 | As a result of studying the course, students will master general cultural and professional competences, namely, they will learn to perceive, analyse, understand socially and personally significant philosophical problems, different worldview paradigms, learn the skills of analytical reading of texts using traditional methods and modern information technologies. | 1, 3, 9 |
| 10 | Physics | BD | UC | 5 | Physical quantities, error calculation, and the SI system. Kinematics and translational dynamics. Force, work, energy, power, and momentum. Mechanical harmonic oscillations and the concept of frequency. Frequency spectrum of time-domain signals and an introduction to Fourier analysis and its applications. Mechanical waves: wavelength, propagation speed, interference, and the Doppler effect. Acoustics: sound, infrasound, and ultrasound, sound fields and their applications. Transition to electromagnetic oscillations and the electromagnetic wave spectrum. | 2, 5, 6 |
| 11 | Engineering Informatics 1 | BD | UC | 5 | The course aims to develop a comprehensive body of knowledge in the field of information technologies. The curriculum includes the study of software engineering methodology, planning and execution of assigned tasks, requirements analysis, computer architecture and its features, data encoding and | 6, 10 |

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|---|---|---|---|---|---|---|
| | | | | | representation, Boolean algebra and its application in computing, algorithms and data structures such as sorting, searching, linked lists, trees, etc., as well as runtime evaluation. | |
| 12 | Foreign language (German Language A1) | ДВО | UC | доп | The course aims to develop basic communication skills and practical use of a foreign language in everyday life. Students will learn to use simple phrases, participate in short dialogues, and express basic ideas both orally and in writing. | 1, 3 |
| 13 | Introduction to Applied Engineering Sciences 1 | BD | UC | 5 | The course of study emphasizes the training of students and the development of their understanding of future professional activities. Students learn specialized vocabulary, theoretical concepts, and the fundamentals of their field of study, as well as the specific aspects of engineering and the role of engineers in today's world. They learn how to formulate engineering tasks, define criteria, demonstrate creativity, design for innovation, and develop both professional and personal skills. The course also assists students in selecting an individualized educational path by providing guidance on value systems, sustainable development principles, safety measures, and anti-corruption practices. | 1, 3, 9 |
| 14 | Engineering Mathematics 2 | BD | UC | 7 | The discipline forms mathematical knowledge and skills in students, allowing them to engage in scientific and professional activities in the future, as well as skills and abilities in solving engineering problems. It includes integral calculus for functions of one variable and Fourier series, differential calculus for functions of several variables, error calculation, problems on extreme values, the least squares method, ordinary differential equations, the Laplace transform, oscillations, systems of differential equations, coupled oscillations, scalar and vector fields, differential operators, integrals over regions, curves and surfaces. | 2, 6 |
| 15 | Engineering Informatics 2 | BD | UC | 3 | The course is designed to provide undergraduate students with foundational competencies in the use of modern information technologies and practical skills for working with application software tools. The curriculum includes an introduction to Python programming, covering key concepts such as variables, conditional statements, loops, functions, and file handling (reading and writing data). Additionally, students explore data visualization techniques, the creation of custom Python modules, and the integration of external libraries. The course also provides an introductory overview of programming in MATLAB and C. | 6, 10 |
| 16 | Fundamentals of Electrical Engineering 2 | BD | UC | 5 | Direct current (DC) and alternating current (AC) quantities; sinusoidal voltage. Representation of sinusoidal waveforms and frequency dependence. Series and parallel AC circuits. Power in AC circuits: active, reactive, and apparent power; | 4, 6, 10 |

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|---|---|---|---|---|---|---|
| | | | | | power factor and methods of power factor improvement. Complex circuit analysis for series, parallel, and mixed configurations. Two-port networks and network calculations. | |
| 17 | Fundamentals of Electronics 1 | BD | UC | 5 | Fundamentals of logic functions. Number systems and encoding. Computation using logic functions. Logic function minimization. Common combinational logic functions. Systematic design and analysis of combinational circuits. Sequential circuits (flip-flops). Arithmetic logic unit (ALU). | 4, 10 |
| 18 | Materials, Components and Technologies | BD | UC | 5 | The objective of this course is to develop students' knowledge in the field of materials science and the technologies applied in various areas of engineering and manufacturing. The curriculum covers the structure of matter, materials and crystal lattices, band theory, insulators, metals, and semiconductors. Topics include electrical conductivity, resistance/conductance, the design and fabrication of resistors, capacitors, inductors, and magnetic materials. The course also addresses semiconductor materials, doping methods, p-n junctions, diodes, transistors, charge carrier distribution and temperature behavior, silicon processing, lithography, and the production of integrated circuits. | 4, 10 |
| 19 | Foreign language (German A2): Introduction to Applied Engineering Sciences 2 or Short Technical Project | ДВО | UC | доп | The course focuses on developing communication skills in daily situations and social contexts. Students will be able to use familiar expressions, engage in simple conversations, reproduce and analyze short texts, and present ideas orally and in writing following language norms. | 1, 3 |
| 20 | Signals and systems | BD | UC | 5 | The objective of this course is to develop a systematic approach among undergraduate students for analyzing the behavior of radio-electronic systems and determining their response to given input signals. The course covers continuous and discrete signals and systems, signal operations, the effect of deterministic signals on linear time-invariant systems, modulated signals, z-transformation, frequency characteristics, and the properties of discrete-time systems. It also includes methods for computing system responses. | 2, 4, 6 |
| 21 | Physical technologies | BD | UC | 5 | Geometrical and wave optics: image formation using lenses and mirrors, lenses, mirrors, interference, diffraction, and resolving power. Optical instruments, fiber optics, and microscopy. Electromagnetic oscillations and types of radiation | 4, 6, 7 |

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|---|---|---|---|---|---|---|
| | | | | | (radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays), as well as polarization. Molecular and nuclear physics, radioactivity, and radiation safety. Lasers: coherence, light amplification, measurement techniques, and optical tomography. | |
| 22 | Fundamentals of chemistry | PD | UC | 5 | Classification of substances, atomic structure, periodic table. Chemical bonding, intermolecular interactions, properties of substances. Mixing, solubility, stoichiometry, mole, concentration. Reaction balance, equilibrium, law of mass action. Solution properties, analytical chemistry, redox reactions, electrolysis, galvanic cells. Fundamental compounds, VSEPR theory. | 6, 7 |
| 23 | Fundamentals of electronics 2 | BD | UC | 8 | RLC circuits: components such as resistors, inductors, and capacitors; transfer functions and circuit design principles. Diodes: rectifier, switching, and Zener diodes; signal processing. Transistors: bipolar junction and field-effect transistors; basic configurations, operating point, amplifiers, switching and small-signal amplifiers, feedback, current sources. Operational amplifiers: characteristics, feedback, frequency response, oscillation generation, circuit applications. | 4, 10 |
| 24 | Biomedical Engineering Technology Seminar | PD | UC | 2 | ntroduction to Biomedical Engineering. Usefulness and meaning of each subject in studies. Example of developing a biomedical device from idea to realisation. Working with literature (textbooks, technical specifications, notes). Introduction to reading schematics. Participation in English-language lectures on biomedical research | 1, 7 |
| 25 | Microcomputer technology | BD | UC | 5 | The course explores the structure of the CPU and the arithmetic logic unit (ALU), as well as the connection of necessary memory components to the system bus, using the Arduino UNO as an example. It covers interrupt handling and polling mechanisms, operation of the watchdog timer, and key microcontroller components such as timers, ADCs (analog-to-digital converters), and PWM (pulse-width modulation). The course includes hands-on practice with Arduino UNO and various modules. | 4, 10 |
| 26 | Foreign language (German Language B1) | ДВО | UC | доп | The course is designed to enhance communication skills in social and socio-political contexts. Students will learn to express opinions freely, discuss familiar topics, participate in dialogues and polylogues, analyze technical texts, and present ideas orally and in writing according to language standards. | 1, 3 |
| 27 | Measurement technology | BD | UC | 5 | Fundamentals and core concepts of measurement engineering. Measurement uncertainty and errors. Principles of measuring electrical quantities. Digital | 4, 5, 6 |

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| | | | | | acquisition of measured values. Structure and operating principles of analog and digital instruments used for electrical measurements. Measurement amplifiers. Oscilloscopes and spectral analysis. Basics of measuring key process variables. | |
| 28 | Fundamentals of biostatistics | PD | UC | 5 | Fundamentals of Statistics. Data exploration: location parameters, scatter parameters, shape parameters. Distributions: Parameters, properties, examples. Statistical tests: hypotheses, errors, applications. Design of experiments. Application of digital signal and image processing algorithms. Correlation analysis: pattern matching. Discrete Fourier Transform: amplitude and phase spectra. Digital filters: signal processing and feature extraction. | 5, 6 |
| 29 | Digital signal processing | BD | UC | 5 | Discrete signals (sampling and reconstruction). LTI systems (characteristics and classification). Correlation and convolution. Fourier transforms and window functions. Z-transform and pole-zero (P/Z) diagrams. Digital filters: properties and design. | 2, 4, 6 |
| 30 | Communication technology | BD | UC | 5 | Functional blocks of message transmission. Analog and digital signals. Addition and multiplication of harmonic oscillations. Amplitude modulation. Angle modulation. Digital carrier modulation techniques. Noise suppression in digital carrier modulation. | 4, 6, 10 |
| 31 | Medical technology 1 | PD | UC | 5 | The aim of the course is to provide an overview of biomedical technologies, biomedical measurement technology, biopotentials and electrophysiology. Main technical requirements of MP. Planning and practical implementation of revision tests (STK, FTK). Medical technologies in diagnostics (special areas of electrophysiology EEG, EMG, VEP, ECG). Medical technologies in therapy and diagnostics (ventilation and lung function). Medical technologies in electrotherapy (NF therapy, HF therapy, electromagnetic fields/stimulation and stimulation). | 5, 7 |
| 32 | Anatomy & Physiology 1 | PD | UC | 5 | The aim of the discipline is to study the structural and functional features of human organs and systems. Orientational and topographic anatomy of the human body. Electrophysiological and biochemical foundations of life. Cells and tissues, cell division and death. Organic anatomy and physiology (muscles, nerves and sensory organs, skin). Functional anatomy and physiology (CNS, cardiovascular system, respiration, hemostasis, nutrition and excretion). Anatomy and physiology of sensory perception. Features of the embryo and fetus, as well as reproductive processes. | 4, 6, 7 |

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| 33 | Foreign language (German Language B2) | ДВО | UC | доп | The course deepens skills in the practical application of a foreign language in socio-political, industrial, and academic fields. Students will confidently engage in discussions, substantiate their views, analyze complex texts, and express their thoughts orally and in writing in line with language norms. | 1, 3 |
| 34 | Control Engineering | BD | UC | 5 | The discipline studies the modelling of dynamic systems in time and frequency domains, their properties, calculation of responses, linearisation, model coupling, identification, stability, closed-loop properties, design of standard, adaptive and tuning rules for controllers, as well as design of compensators and controllers in the frequency domain. Numerical methods for analysis and control circuit design are also covered. | 4, 6, 10 |
| 35 | Biomedical Signal Processing | PD | UC | 5 | Fundamentals of Statistics.Data exploration: location parameters, scatter parameters, shape parameters. Distributions: Parameters, properties, examples. Statistical tests: hypotheses, errors, applications. Design of experiments.- Application of digital signal and image processing algorithms. Correlation analysis: pattern matching. Discrete Fourier transform: amplitude and phase spectra. Digital filters: signal processing and feature extraction | 4, 5, 6 |
| 36 | Medical Measurement Technology | PD | UC | 5 | Fundamentals and basic terms of biomedical metrology; An overview of biomedical metrology; Origin and properties of biosignals; Biomedical Sensors;Amplifiers in biomedical metrology; Interference and filtering in biomedical metrology; Digitisation of biosignals. | 4, 5, 7 |
| 37 | Development of Medical Products 1 | PD | UC | 5 | The course develops students' comprehensive. Knowledge of the main methods of designing and developing medical devices, including planning, manufacturing, testing, approval. Regulation, standards, specifications, rules for the development of medical devices (MD). "Reverse" engineering, practical application. Design of medical devices: sensors, electronics, hydraulics, pneumatics, drives, control. Reading diagrams. Development for clinical, mobile, rescue and home use. | 4, 7, 8 |
| 38 | Medical Engineering 2 | PD | UC | 5 | The discipline studies medical technologies in therapy: technology of infusion devices, dialysis technologies and system components, active prostheses (pacemakers). Rehabilitation technologies: prostheses, artificial organs, biomedical robotics. Biomedical generation, formation and processing of images (ionizing/non-ionizing technologies). Medical technologies in diagnostics (components and designs): Doppler and ultrasound technologies, X-ray technologies, CT machines, MRI technologies, PET technologies | 4, 7 |

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| 39 | Anatomy & Physiology 2 | PD | UC | 5 | The goal is to provide knowledge of human anatomy and physiology with age-related developmental features. The course studies the subject and tasks of age-related anatomy and physiology. The relationship of age-related anatomy and physiology with other sciences. Modern directions of scientific research of the functions of a living organism. Age-related features of the structure and properties of a neuron, nerve fiber and nerve centers. | 4, 6, 7 |
| 40 | Foreign language (German Language B2+) | ДВО | UC | доп | The course focuses on improving communication skills in professional and academic fields, including production and research contexts. Students will participate confidently in dialogues and polylogues, analyze technical texts, and present ideas orally and in writing with a high degree of accuracy. | 1, 3 |
| 41 | Digital image processing | PD | UC | 5 | Image properties, image transformations;<br>Linear and nonlinear filtering;<br>Geometric operators;<br>Image processing in the frequency domain;<br>Feature segmentation and highlighting;<br>Classification of image objects;<br>Introduction to image processing using HLL;<br>Implementation of the above algorithms in the independent solution of the problem of industrial image processing. | 2, 4 |
| 42 | Development of medical products 2 | PD | UC | 5 | The objective of the course is to develop students' professional knowledge and skills in the field of medical technology and knowledge of modern computer-aided design (CAD) systems, and to provide students with skills in working with "mechanical" (SolidWorks, KOMPAS) and "electrical" (AltiumDesigner) CAD systems for developing electronic devices. Development of devices taking into account safety: devices, materials, testing process, test planning, technical documentation. | 4, 7, 8 |
| 43 | Interdisciplinary Project: Business Administration | GED | UC | 5 | The course covers the fundamentals of business, including sales and marketing tools within management processes; procedures for physical and financial planning; procurement and production organization; human resource management; investment and financing. Students develop competencies in economics and law, entrepreneurship, and financial literacy. | 2, 8, 13 |
| 44 | Elective modules | PD | EC | 5 | Optional modules | |
| 45 | Elective modules | PD | EC | 5 | Optional modules | |
| 46 | Elective modules | PD | EC | 5 | Optional modules | |

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| 47 | Internship | PD | Пр | 12 | Formation of knowledge on operation of systems and equipment, working conditions of service personnel, occupational safety and health rules. Mastering the skills of independent planning of activities, constructive interaction with colleagues. Research algorithms from collecting materials and choosing calculation methods to practical design solutions. | 4, 10 |
| 48 | Colloquium on the Internship | PD | Пр | 3 | It is a complex of processing research materials and presenting research results. Particular attention is paid to the algorithm of actions for preparing the resulting conclusions. Tasks of describing research methods, graphs and diagrams, formulating research conclusions, summarizing literature, drawing up links to sources and others are being worked out. | 1, 2, 8 |
| 49 | Bachelor's Degree Thesis | FC | FC | 12 | The final study, which confirms the student's ability to apply the knowledge gained in practice: identify relevant questions, put hypotheses, collect, process and analyze data, make calculations, solve professional problems. Thesis demonstrates the level of training, skills of and critical thinking and readiness for further work, training or scientific activities. | 1, 2, 9 |
| 50 | Bachelor's Colloquium | FC | FC | 3 | Confirmation of the competence of the graduate: the ability to present the results of work, substantiate conclusions, answer questions, argumentation skills. | 1, 2, 8 |
| | Elective modules (1-18) including: | PD | EC | 15 | | |
| 1 | Augmented and Virtual Reality - Principles and Practice | PD | EC | 5 | Basics: AR/VR (presence, immersion, interactivity, visualization methods, tracking, displays, software). AR/VR Applications (Advantages/Disadvantages, Problems) Creating base application: for virtual reality (Unity, Windows Mixed Reality, SteamVR, OpenVR, Visual Studio) for augmented reality (Unity, HoloLens 2, Android, Vuforia, Visual Studio) Interaction with virtual elements in AR/VR (collider, physics)№ | 2, 4 |
| 2 | Machine Learning and AI | PD | EC | 5 | Introduction to Machine Learning (MOD)<br>The difference between artificial intelligence and MO<br>Identify the issue and related questions<br>Model architecture and MO methods (graphical methods, artificial intelligence)<br>Preprocessing and data standardization, feature extraction<br>Supervised and unsupervised learning<br>Importance of the loss function | 2, 12 |

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| | | | | | Machine learning algorithms training and validation<br>Classification/regression, probability/distribution basis. | |
| 3 | Software Design | PD | EC | 5 | Introduction to object orientation: advantages/disadvantages (examples);<br>Model-based software design framework from analysis to design; Visual modeling using UML;<br>UML interaction diagrams as a communication tool in software design; From UML Diagram to Program Code; Software systems testing strategies; A hands-on course using a PC/laptop. | 2, 4, 9 |
| 4 | Internet Security | PD | EC | 5 | The course covers cyber threats and data protection.<br>Examples of attacks (Slammer, Stuxnet, Snowden), technical threats (DDoS, malicious code, vulnerabilities, web attacks, CVSS), social engineering are analyzed.<br>Security levels are considered: network (IP, IPSec, IKE), transport (SSL/TLS, TCP, UDP), wireless networks (WEP, WPA2), SSH protocol, tunneling (PPTP, L2TP, L2TP), authentication methods. | 4, 11 |
| 5 | Embedded Systems Programming | PD | EC | 5 | The structure and mode of operation of embedded computer systems with and without an operating system. Implementing complex tasks in individual or distributed networked computer systems. Define and implement simple requirements for real-time applications. Basics of the Linux operating system. Learning the C or Python programming language. | 4, 10 |
| 6 | Applications of Programmable Logic | PD | EC | 5 | Programmable LUNs. Low Cost FPGA series, for example, Cyclone (Intel). Basics of the VHDL programming language Programmable chip system (SOPC). Practical course (e.g. streaming MP3 over Ethernet using Intel FPGA. Cyclone IV). | 2, 4, 10 |
| 7 | Digital Image Processing | PD | EC | 5 | Image properties, image transformations;<br>Linear and nonlinear filtering;<br>Geometric operators;<br>Image processing in the frequency domain;<br>Feature segmentation and highlighting;<br>Classification of image objects;<br>Introduction to image processing using HLL;<br>Implementation of the above algorithms in the independent solution of the problem of industrial image processing. | 2, 4 |

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| 8 | Selected Chapters of Medical Technology | PD | EC | 5 | The course of study emphasizes the training of students and the development of their understanding of future professional activities. Students learn specialized vocabulary, theoretical concepts, and the fundamentals of their field of study, as well as the specific aspects of engineering and the role of engineers in today's world. They learn how to formulate engineering tasks, define criteria, demonstrate creativity, design for innovation, and develop both professional and personal skills. The course also assists students in selecting an individualized educational path by providing guidance on value systems, sustainable development principles, safety measures, and anti-corruption practices. | 3, 12 |
| 9 | Project Work | PD | EC | 5 | Introduction to practical engineering technologies; Orientation and processing of current topics in group work; Visiting companies to establish contacts for internships and dissertations; Development of the first scientific evidence with presentation. | 8, 9, 13 |
| 10 | Interdisciplinary Project | PD | EC | 5 | The course is an interdisciplinary program designed to foster teamwork and project management skills, while also providing a comprehensive understanding of engineering technologies. The curriculum encompasses subjects such as economics, law, entrepreneurship, and financial literacy, equipping students with a well-rounded set of skills. | 8, 9, 13 |
| 11 | Quality Management Specialist | PD | EC | 5 | The course covers principles and methods of quality management, standardization, certification, auditing, and quality control. It explores quality management systems (ISO 9001), risk management, process improvement, and analytical methods. Special attention is given to modern tools and technologies for ensuring quality across various industries. | 1, 2, 8 |
| 12 | Project and Quality Management | PD | EC | 5 | The aim of the course is to develop the skills of ISO 9001 Quality Management in students. During the course of studying the course, the following are considered: structure, content, practical methods (planning, control, assurance, quality improvement (CTQ, Kano, FMEA)), management plan, process capabilities, Q control chart, PDCA; Classical project management processes: initiation, definition, planning, control, completion; Agile project management: preparation, implementation using SCRUM; Network plan technique: creation, use for planning and control of projects. | 8, 9, 13 |
| 13 | Law | PD | EC | 5 | The aim of the discipline is to study constitutional law, a fundamental branch of law that regulates the foundations of the state system, the rights and freedoms of citizens, and the system of state authorities. The discipline studies: the basic | 1, 3, 13 |

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| | | | | | principles of constitutional law - the rule of law, democracy, separation of powers and legal statehood; The Constitution and its role – the structure, functions and mechanisms for implementing the norms of the Constitution in public administration; the rights and freedoms of man and citizen – their guarantees, restrictions and methods of protection; government bodies – their powers, interaction and principles of activity; electoral law and processes – the procedure for holding elections, the political system and the participation of citizens in governing the state; constitutional reforms and their impact - historical changes, development of legal norms and adaptation of the system to modern challenges. The study of the discipline is aimed at a deep understanding of the principles of legal regulation and the development of analytical skills for working with constitutional norms. | |
| 14 | Media Project | PD | EC | 5 | The aim of the course is to develop skills of critical analysis and project management in the audiovisual sphere. Models and methods of media project management, creation of technical specifications, and application of software are studied. The practical implementation of tasks covers audiovisual projects, multimedia applications, as well as the development of both hardware and software necessary for the successful implementation of media projects. | 2, 8 |
| 15 | Starting a Business | PD | EC | 5 | The purpose of the course is to develop students' basic knowledge and practical skills necessary for creating and running a business, as well as understanding key aspects of business management in modern economic conditions. The course studies an introduction to entrepreneurship, where students consider: concept, essence and types of entrepreneurial activity, the role of entrepreneurship in the economy, the history of the development of entrepreneurship. During the course of studying the discipline, students acquire the skills of choosing a business idea and market analysis, business models and their types, developing a business plan. | 2, 9, 13 |
| 16 | Engineering Ethics | PD | EC | 5 | The course is focused on the study of engineering ethics, the engineer's code of ethics, and the professional code of conduct. It includes analysis of risks and technological opportunities in life sciences, including genetic engineering and nanotechnology. The course also explores the environmental aspects of technological development and the engineer’s responsibility for the safety of innovations. Case studies are examined on topics such as water usage, | 1, 13 |

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| | | | | | sanitation, and eco-technologies. Students develop critical thinking skills and the ability to account for environmental safety in engineering practice. | |
| 17 | Electronic Circuits | PD | EC | 5 | Voltage regulators for power supply systems. Controlled sources and impedance converters. Signal generators. Active filters (linear and switched-capacitor types). Analog computational circuits. | 2, 4, 10 |
| 18 | Digital Circuit Design | PD | EC | 5 | The aim of the course is to develop students' systemic knowledge and practical skills in the field of designing digital electronic circuits using modern CAD systems and project verification methods. The course covers the following: principles of constructing digital devices, logical elements and their characteristics, hardware description languages (VHDL, Verilog), hierarchical design, synthesis of logical circuits, methods of optimizing digital devices, an overview of modern CAD systems (Cadence, Altium, KiCad), working with component libraries, and design automation. | 4, 10 |

**Appendix №3**

**Matrix of correlation between the learning outcomes of the educational programme as a whole and the competences formed**

| № | Learning outcomes/ Module name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Kazakh language 1 | + | | + | | | | | | | | | | |
| 2 | Foreign language (technical scientific English) | + | | + | | | | | | | | | | |
| 3 | Fundamentals of Electrical Engineering 1 | | | | + | | + | | | | + | | | |
| 4 | History of Kazakhstan | + | | | | | | | | + | | | | |
| 5 | Advanced preparatory course for STEM subjects (Mathematics, Physics) | + | + | | | | + | | | | | | | |
| 6 | Foreign language (German) | + | | + | | | | | | | | | | |
| 7 | Engineering Mathematics 1 | | + | | | | + | | | | | | | |
| 8 | Kazakh language 2 | + | | + | | | | | | | | | | |
| 9 | Philosophy | + | | + | | | | | | + | | | | |
| 10 | Physics | | + | | | + | + | | | | | | | |
| 11 | Engineering Informatics 1 | | | | | | + | | | | + | | | |
| 12 | Foreign language (German Language A1) | + | | + | | | | | | | | | | |
| 13 | Introduction to Applied Engineering Sciences 1 | + | | + | | | | | | + | | | | |
| 14 | Engineering Mathematics 2 | | + | | | | + | | | | | | | |
| 15 | Engineering Informatics 2 | | | | | | + | | | | + | | | |
| 16 | Fundamentals of Electrical Engineering 2 | | | | + | | + | | | | + | | | |
| 17 | Fundamentals of Electronics 1 | | | | + | | | | | | + | | | |
| 18 | Materials, Components and Technologies | | | | + | | | | | | + | | | |
| 19 | Foreign language (German A2): Introduction to Applied Engineering Sciences 2 or Short Technical Project | + | | + | | | | | | | | | | |
| 20 | Signals and systems | | + | | + | | + | | | | | | | |
| 21 | Physical technologies | | | | + | | + | | + | | | | | |
| 22 | Fundamentals of chemistry | | | | | | + | + | | | | | | |
| 23 | Fundamentals of electronics 2 | | | | + | | | | | | + | | | |
| 24 | Biomedical Engineering Technology Seminar | + | | | | | | + | | | | | | |
| 25 | Microcomputer technology | | | | + | | | | | | + | | | |
| 26 | Foreign language (German Language B1) | + | | + | | | | | | | | | | |
| 27 | Measurement technology | | | | + | + | + | | | | | | | |
| 28 | Fundamentals of biostatistics | | | | | + | + | | | | | | | |
| 29 | Digital signal processing | | + | | + | | + | | | | | | | |
| 30 | Communication technology | | | | + | | + | | | | + | | | |
| 31 | Medical technology 1 | | | | | + | | + | | | | | | |
| 32 | Anatomy & Physiology 1 | | | | + | | + | + | | | | | | |
| 33 | Foreign language (German Language B2) | + | | + | | | | | | | | | | |
| 34 | Control Engineering | | | | + | | + | | | | + | | | |
| 35 | Biomedical Signal Processing | | | | + | + | + | | | | | | | |
| 36 | Medical Measurement Technology | | | | + | + | | + | | | | | | |
| 37 | Development of Medical Products 1 | | | | + | | | + | + | | | | | |
| 38 | Medical Engineering 2 | | | | + | | | + | | | | | | |
| 39 | Anatomy & Physiology 2 | | | | + | | + | + | | | | | | |
| 40 | Foreign language (German Language B2+) | + | | + | | | | | | | | | | |
| 41 | Digital image processing | | + | | + | | | | | | | | | |

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| 42 | Development of medical products 2 | | | | + | | | + | + | | | | | |
| 43 | Interdisciplinary Project: Business Administration | | + | | | | | | + | | | | | + |
| 44 | Elective modules | | | | | | | | | | | | | |
| 45 | Elective modules | | | | | | | | | | | | | |
| 46 | Elective modules | | | | | | | | | | | | | |
| 47 | Internship | | | | + | | | | | | + | | | |
| 48 | Colloquium on the Internship | + | + | | | | | | + | | | | | |
| 49 | Bachelor's Degree Thesis | + | + | | | | | | | + | | | | |
| 50 | Bachelor's Colloquium | + | + | | | | | | + | | | | | |
| | **Elective modules (1-18) including:** | | | | | | | | | | | | | |
| 1 | Augmented and Virtual Reality - Principles and Practice | | + | | + | | | | | | | | | |
| 2 | Machine Learning and AI | | + | | | | | | | | | | + | |
| 3 | Software Design | | + | | + | | | | | + | | | | |
| 4 | Internet Security | | | | + | | | | | | | + | | |
| 5 | Embedded Systems Programming | | | | + | | | | | | + | | | |
| 6 | Applications of Programmable Logic | | + | | + | | | | | | + | | | |
| 7 | Digital Image Processing | | + | | + | | | | | | | | | |
| 8 | Selected Chapters of Medical Technology | | | + | | | | | | | | | + | |
| 9 | Project Work | | | | | | | | + | + | | | | + |
| 10 | Interdisciplinary Project | | | | | | | | + | + | | | | + |
| 11 | Quality Management Specialist | + | + | | | | | | + | | | | | |
| 12 | Project and Quality Management | | | | | | | | + | + | | | | + |
| 13 | Law | + | | + | | | | | | | | | | + |
| 14 | Media Project | | + | | | | | | + | | | | | |
| 15 | Starting a Business | | + | | | | | | | + | | | | + |
| 16 | Engineering Ethics | + | | | | | | | | | | | | + |
| 17 | Electronic Circuits | | + | | + | | | | | | + | | | |
| 18 | Digital Circuit Design | | | | + | | | | | | + | | | |