Transilvania University of Braşov, Romania

Study program: Medical Engineering

Faculty: Design product and Environment

Study period: 4 years (bachelor)

1st Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Mathematical Analysis	MKTAM01	Romanian	5	2	3	-	-

Course description (Syllabus): Real numbers, numerical series, real functions, n-dimensions space, limits, differential calculi, integral calculi.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Introduction in biomedical engineering	IBmed	Romanian	4	1	-	2	-

Course description (Syllabus): Medical engineering - fundamental concepts. Why exact fundamental sciences-mathematics, physics, mechanics in the medical engineering formation? Why technical sciences-chemistry, materials, technologies in the medical engineering formation? Implication of informatics in medical engineering. Connection with measurement, mechanisms and machines parts. Biological systems and signal analysis, sensors, guidance and control devices. Basic structure of a project in the medical engineering.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Aided Graphics I	DIDT01	Romanian	5	2	-	2	-

Course description (Syllabus): Representations used in industrial design, sections and cuttings, industrial technical drawing odds, representations and odds for machine parts, surfaces state, inclusion of tolerances, deviations of form and position, overall and assembly design.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Chemistry	MKCTH01	Romanian	4	2	-	1	-

Course description (Syllabus): Basic notions on matter structure, Chemical general notions, Chemical elements systematization, Chemical bonds, Inorganic composed substances, Aggregation states, Water, Disperse systems, Metallic materials, Organic and inorganic based materials applied in medical engineering.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Materials Science	MKTSM01	Romanian	5	3	-	2	-

Course description (Syllabus): introduction in the materials' field, Ferrous alloys. Thermic and thermo-chemical treatments. Non-ferrous alloys. Polymers. Composite materials. Ceramics. Implants' materials, Ferrous and non-ferrous alloys manufacturing. Metals casting. Powders metallurgy. Plastic deformation. Metals welding. Non-conventional and connected welding process.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages I	MKTPC01	Romanian	5	1	-	3	-

Course description (Syllabus): elementary algorithms, logical schemas, C++ program structure, arithmetic expressions, calls the functions and outputs, entries in the program, applications writing, logical expressions and control structures for selection – loops, functions and control structures.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Linear algebra, analytical and differential geometry	DIAGAD	Romanian	4	2	2	-	-

Course description (Syllabus): – Vector spaces. Linear transformations. Eigenvalues and eigenvectors. Free vectors. Line and plane in space. Conics. Quadrics. Surfaces generation. Differential equations bases – Cauchy's problem solution. Differential equations: Bernoulli, Riccati, Lagrange, Clairaut, Euler etc. Homogenous, linear and with exact total differential equations.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Aided Graphics II	MKTDT02	Romanian	5	2	-	2	-

Course description (Syllabus): – Basic elements for drawing, 2D drawing and editing commands, advanced drawing and editing techniques, entities' properties, drawing and annotation techniques, hatching, quotation, viewing and piloting a drawing.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physics I	MKTFZ01	Romanian	4	2	-	1	-

Course description (Syllabus): – Classic mechanics. Restricted relativity theory. Thermodynamics. Electromagnetism. Optics. Atomic physics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electro-technics	MKEA02	Romanian	3	2	-	1	-

Course description (Syllabus): – Electrostatics. Electrodynamics. Electro kinetics. Alternative current circuits.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Applied mechanics	MKTMC02	Romanian	5	3	2	-	-

Course description (Syllabus): Torsors, mass center, solid bodies' statics, friction balance of rigid body, material point kinematics, rigid body kinematics, fundamentals in dynamics, d'Alembert principle, rigid dynamics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Computer Programming and Programming Languages II	MKTPC02	Romanian	4	1	-	2	-

Course description (Syllabus): – Programming languages, types of computers, Arduino developing systems, guidance and control system structure, simple projects developed by developing Arduino platforms.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Communication	TDCO	Romanian	**3**	1	-	1	-

Course description (Syllabus): – Informational society, information and communication technology, documents-classification–library, international standards of information culture-access information-information retrieval tools, search strategies, information evaluation, information management, information communication, plagiarism.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English I	LE01	Romanian	2	1	1	-	-

Course description (Syllabus): The verb: Mood, tense and aspect, Indicative Mood, Modals. The Noun. The Adjective.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
French I	LF01	Romanian	2	1	1	-	-

Course description (Syllabus): Article. Regular verbs: present time. The object complementary pronouns. Verbs past time.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
German I	LG01	Romanian	2	1	1	-	-

Course description (Syllabus): The genitive and the reflexive verbs. Perfect past time of verbs. Prepositions with dative and with accusative – derivative nouns. Secondary propositions introduced by *wenn* and by *weil*. Secondary propositions topics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Spanish I	LS01	Romanian	2	1	1	-	-

Course description (Syllabus): Alphabet and pronunciation rules. Present indicative verb. *Ser* and *Estar* verbs. The pronoun. The adjective. Accentuation rules.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training I	EF01	Romanian	1	-	1	-	-

Course description (Syllabus): Speed race. Medium and long distances races.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English II	LE02	Romanian	2	1	1	-	-

Course description (Syllabus): Word order (in declarative/ interrogative/ imperative/ exclamatory sentences). Sequence of tenses I (in direct object and time clauses. Sequence of tenses II (in conditional clauses). Reported speech (statements, questions, commands, exclamations). Inversion. Negation. Complex sentences I (Subject/ Predicative/ Appositive/ Direct Object/ Indirect Object/ Object Complement/ Adjective Complement/ Prepositional Complement/ Relative Clauses). Complex sentences II (Adverbial Clauses of Time/ Place/ Manner/ Comparison/ Reason/ Condition/ Purpose/ Result/ Concession).

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
French II	LF02	Romanian	2	1	1	-	-

Course description (Syllabus): The verb – its grammatical classes. Ist and IInd group verbs. IIIrd (irregular) verbs.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
German II	LG02	Romanian	2	1	1	-	-

Course description (Syllabus): Oscillating prepositions – nominative group. Imperative – modal verb *sollen*. Comparative mode by *als* or by *wie*.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Spanish II	LS02	Romanian	2	1	1	-	-

Course description (Syllabus) –Accentuation rules. Past times of the verb. Future time of the verbs. Preposition.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training II	EF02	Romanian	1	-	1	-	-

Course description (Syllabus): Segment general force development. Football – technical and tactical bases.

2nd Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Applied computer science	ANUM	Romanian	4	2	-	1	-

Course description (Syllabus): Programming elements, types and data structures, programming structures, graphic representations elements, and objects included in the front panel, operations with files, applications planning.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Optoelectronics	OPEL	Romanian	5	2	-	2	-

Course description (Syllabus): Light, display systems, electroluminescent and laser diode, optic modulation, photo-detection, optic fiber.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Special mathematics, and statistics.	DIMS03	Romanian	4	2	2	-	-

Course description (Syllabus): First order differential equations. Differential equations systems. Symmetrical systems. Numbers and complex functions. Classic probabilistic schemes. Discreet random variables.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Electronics	ELEC	Romanian	4	2	-	1	-

Course description (Syllabus): Elements of network analyse. Solid body devices. Amplifiers' principles. Negative reaction. Adaptation and impedance. Emitter repeater. Semiconductor devices. CC amplifier. Sources. Rectifiers and stabilizers. Boolean algebra bases. Sequential logic circuits.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Biomechanics	BMEC	Romanian	6	2	1	2	-

Course description (Syllabus): Basic principles of mechanics. Basic models of mechanics. Physical – mechanical models of bodies. Biostatics. Biodynamic. Locomotors.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Strength of materials	DIRM03	Romanian	6	3	1	1	-

Course description (Syllabus): Sectional stress diagrams. Tractions and compression. Conventional shearing of beams. Elastic theory elements. Static moments and inertial moments of surfaces. Straight beams torsion, and bending. Breaking classical theories and composed loading of beams. Composed stresses.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Mechanical engineering I	EIM	Romanian	4	2	-	1	-

Course description (Syllabus): Dimensional precision. Parts assembling. Tolerance units. Tolerance systems. Orientation and placement precision of fabricated parts. Maximum material principle. Dimensional chains.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Numerical methods	MNUM	Romanian	4	2	-	2	-

Course description (Syllabus): Errors. Algebraic and transcendent equations. Matrix algebra and linear equations systems. Interpolation methods. Numeric derivatives. Numeric integration. Applications in medical engineering.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Mechanisms and precision mechanics elements	MCMF	Romanian	5	3	-	1	1

Course description (Syllabus): Mechanisms' structure bases. Involute gearing geometric and kinematic bases. Mechanisms with fix axes gears – structure, kinematics and dynamics. Jointed rods mechanisms. Assembling. Springs. Gearing. Bearings.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Biomaterials	BMAT	Romanian	4	2	-	2	-

Course description (Syllabus): Medical components and devices: structure, material, implementation. Bases of biomaterials. Metallic biomaterials. Behaviour of biomaterials used in bio-systems. Technologies for biomaterials fabrication. Processing characteristics of biomaterials. Analyse methods and techniques for biomaterials behaviour.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physics II (medical systems physics)	THPL	Romanian	3	2	-	1	-

Course description (Syllabus): Fluid mechanics basics. Complements of thermodynamics. Elastic waves. Light-electromagnetic wave.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Histo-physiology and pathologic anatomy	ANA1/ANA2	Romanian	4	3	-	2	-

Course description (Syllabus): Bones system. Muscular system: skeleton, muscles, pathologies, kinesthetic analyzer. Heart anatomy and physiology, dysfunction and pathology. Eye anatomy and physiology, visual analyzer. Acoustic and vestibular analyzer. Olfactory organ anatomy and physiology, olfactory analyzer.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English III	LE03	Romanian	2	1	1	-	-

Course description (Syllabus): Mathematical symbols and formulas. Quadratic and simultaneous equations. Indices and logarithms. Geometry. Trigonometry. Functional notation. Limits. Differentiation. Integration

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
French III	LF03	Romanian	2	1	1	-	-

Course description (Syllabus): Metals. Measurement. Functional design. Energy, heat and work. Guidance devices. Pumps.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
German III	LG03	Romanian	2	1	1	-	-

Course description (Syllabus): Metals. Measurement. Functional design. Energy, heat and work. Guidance devices. Pumps.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Spanish III	LS03	Romanian	2	1	1	-	-

Course description (Syllabus): Present indicative verb (recap). Subjunctive (present, imperfect, perfect and pluperfect). Subjunctive (concordance).

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training III	EF03	Romanian	1	-	1	-	-

Course description (Syllabus): Assimilating specific aerobic gymnastics skills. Increased capacity of effort by means specific to aerobic gymnastics. Strengthen of back and abdominal muscles through specific exercises. Acquiring some choreographic steps in aerobic gymnastics. Assimilating combinations of choreographic steps for aerobic gymnastics. Applying a specific choreographic program with specific music.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
English IV	LE04	Romanian	2	1	1	-	-

Course description (Syllabus): Word order (in declarative/interrogative/imperative/exclamatory sentences). Sequence of tenses I (in direct object and time clauses. Sequence of tenses II (in conditional clauses). Reported speech (statements, questions, commands, exclamations). Inversion. Negation. Complex sentences I (Subject/Predicative/Appositive/ Direct Object/Indirect Object/Object Complement/Adjective Complement/Prepositional Complement/ Relative Clauses). Complex sentences II (Adverbial Clauses of Time/Place/Manner/Comparison/Reason/Condition/Purpose/Result).

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
French IV	LF02	Romanian	2	1	1	-	-

Course description (Syllabus): Design – etymology and evolution. Multiple definitions –depending on context and on approach. History: birth of design; functionalism; Bauhaus from 1920; the great crisis of 1933, the post-war and organic design. Modernism: conservation and the poetic reinvention. Disciplines and sub-disciplines of design. Design and relationships with fine arts, architecture, industry, technique, engineering etc.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
German IV	LG04	Romanian	2	1	1	-	-

Course description (Syllabus): The use of subjunctive 2. Perfect past tense. Verb: lassen. Prepositions. Conjunctions. Negation. FAQ definition: welcher/was fuer ein. Passive voice. Perfect time. Referieren (Connective Tag 1/2). Relative sentences. Je/desto. Conjunctions (Zeit). Past participle 1 and 2. Kennen and wissen. Wozu? UM ... zu.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Spanish IV	LS04	Romanian	2	1	1	-	-

Course description (Syllabus): Spanish traditions. Popular Spanish holiday's calendar. History and art. Spanish - American Variant.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Physical Training IV	EF04	Romanian	1	-	1	-	-

Course description (Syllabus): Repetition and strengthen of specific technical processes e of basketball. Individual, tactical action specific for handball in attack and in defense. Collective tactical combinations in attack and in the primary defense in basketball and handball games. Counter attack. Tactical actions specific to the game of volleyball.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practical stage	PRAC I	Romanian	4	-	-	90	-

Course description (Syllabus): Medical instruments. Stomatology instruments. Medical equipment: pressure gauge, blood glucose meter, spirometer, portable echography. Analysis of operating mode and of operating risk.

3rd Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Basic technical thermodynamics	TMFL	Romanian	5	3	-	2	-

Course description (Syllabus): General notions of thermal engineering; physical state and transformation characteristics. First and second principles of thermos-dynamics. Perfect gas. Combustion. Introduction to heat transfer. Compressors. Refrigeration devices and heat pumps. General notions of fluid mechanics. Static equilibrium equations of perfect fluids. Basic notions of fluid kinematics. Hydrodynamic similitude.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Programmable numerical systems I	MLCNc	Romanian	5	2	-	1	1

Course description (Syllabus): General principle of technological process. Classic machine tools and processes. CNC machine tools classification. Codes and command functions of CNC machines. CNC machine tools control and guidance software.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Medical informatics	INME	Romanian	4	2	-	1	-

Course description (Syllabus): The human body-a supercomputer. Medical databases. Computerization of medical activity. Biomedical signals. Acquisition and processing of biological signals. Medical Imaging. Computer-aided diagnosis. The recognition of forms - classification. Expert systems in the medicine. Medical information systems. Virtual reality in medicine. Telemedicine. The Internet in medical simulation and training. New trends in medical informatics.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Medical optics and optical equipment	OMEO	Romanian	4	2	-	1	-

Course description (Syllabus): Optical instruments: microscope, telescope, and projector. Systems and devices for measuring the inter-pupillary distance, visual acuity, visual field, ocular refraction, bio-microscope, and iris-scope, sciascope. Systems and devices for measuring the colored view.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Actuation systems (hydro/pneum., electrical)	SIAC	Romanian	4	2	-	2	-

Course description (Syllabus): Basics of actuation systems. Acting, distribution, adjustment elements. Automatic distribution elements. Auxiliary elements. Driving circuits. Design of driving circuit.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Mechanical engineering II	EIMO	Romanian	4	2	-	2	-

Course description (Syllabus): Basics of mechanical engineering, tribology, prosthetics, and robotics. Photometry, subjective and objective methods for measuring the optical radiation. Technical optics, applications based on the phenomena of interference, diffraction and polarization of light. Scattering, absorption of light. The effect of the laser. Laser-principle of operation, types of lasers. The photoelectric effect. Sources of light in optics technology. Objective measurements of colour.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Data acquisition and monitoring	SENZ	Romanian	4	12	-	2	-

Course description (Syllabus): Overview of the sensors and transducers. Structure of a measuring chain. Transducer role in the measurement. Classification of sensors and transducers. Characteristics and performance of sensors and transducers. Parametric electric inductive, resistive sensors, capacitive, piezo, displacement, proximity transducers. Sensors for measuring time, velocities, accelerations, vibrations and rotation, and fluid parameters. Micro sensors. Optical sensors. Laser sensors.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Microprocessors	MICR	Romanian	4	2	-	2	-

Course description (Syllabus): General notions on the digital guidance and control system. Basics on the architecture of computing. Central processing unit (CPU). Input/output devices. RISC, CISC, SISC concepts. Input/output devices. Asynchrony serial communication. Microprocessors on 8 and 16 bits.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Medical electronics	EMED	Romanian	4	2	-	2	-

Course description (Syllabus): Introductive notions on medical apparatus. Main constructive parts of an electronic medical device. Diagnostic devices – temperature, blood pressure, sanguine flow, heart and lung rhythm, EEG, ECG, EMG. X-ray diagnostic apparatus. Clinic laboratory devices. Monitoring devices and telemedicine.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Laboratory testing apparatus	APLA	Romanian	4	2	-	2	-

Course description (Syllabus): Conception and construction of the equipment for preparation of biological samples. Installation, diagnosis and troubleshooting of optical analysis. Construction and debugging Peristaltic Pumps, dispensers and centrifuges. Conception, construction and adaptation of automated equipment for biological analysis. Management and service of the equipment and instruments used in laboratory tests.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Assisted design	PRAC	Romanian	4	2	-	2	-

Course description (Syllabus): The goals and the possibilities of assisted design. Stages of a product assisted design concept. Specific software CAD (CATIA and ProENGINEER). Modules CATIA Sketcher, CATIA Part Design, CATIA Assembly Design. Module ProENGINEER Sketcher. Module ProENGINEER Part Design. Module Pro ENGINEER Assembly Design.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Medical equipment reliability	FIAM	Romanian	4	2	-	2	-

Course description (Syllabus): Elements of probability theory and mathematical statistics. Distribution laws (Gauss-Laplace, Weibull, Raleigh, Poisson, Binomial, Exponential, Gamma, Beta, Student). Basics of reliability. Calculation of systems reliability using Markov processes. Calculation of reliability of series type systems, shakes and mixed. Allocation of reliability. Tools ensuring the reliability of medical devices.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Medical device ergonomics	ERGO	Romanian	2	2	-	1	-

Course description (Syllabus): Capacity analysis for an employee in the medical field. Ergonomic evaluation of specific instruments. Anthropometric and physiologic evaluation of human. Ergonomic evaluation of medical devices, and computer assisted medical apparatus. Ergonomic evaluation of working environment.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Measurement and instrumentation I	MASI	Romanian	4	2	-	2	-

Course description (Syllabus): Basics of measurement. Measuring errors. Method and instruments for measuring. Specific instruments and apparatus for measuring length, angles, mass, capacity, pressure, flow, density, viscosity, humidity, temperatures, electric current intensity, and voltage.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practical work II	PRAC 2	Romanian	3			90	

Course description (Syllabus): Complex medical devices. Operation of medical equipment. Software for ensuring the functioning and adjustment of the equipment. Automated medical systems.

4th Year

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Measurement and instrumentation II	MASI2	Romanian	3	1	-	2	-

Course description (Syllabus): Equipment for diagnosis. Equipment for therapy. Bioelectrical signals and recording. Anthropometric measurements. Electrodes and sensors.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Image treatment, artificial vision and medical imagistic	PIVIM	Romanian	4	2	-	2	-

Course description (Syllabus): Hardware and software systems for information acquisition on different supports. Image preprocessing systems. Changing the primary characteristics of the images. The procedure to improve images using histograms by using false color. The amendment of the images in the frequency. Image processing in different color ranges. Compression systems and storing images. Procedure for deformation, structural change and adding images. Geometric operations for image processing. Image processing - segmentation. Determination of contours and edges in a color or monochrome image. Use and interpretation of optical illusions.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Micro and Nano systems technology	TMNS	Romanian	6	3	-	1	1

Course description (Syllabus): Concepts and principles in micro systems technology. Elements of design for microsystems. Specific microfabrication techniques. Unconventional technologies.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Prosthetic engineering I	IPOPR1	Romanian	6	2	-	1	2

Course description (Syllabus): Biomaterials and biocompatibility. Classification. Metals. Polymers. Ceramics. Composites. Biomaterials-based shape memory alloys. Methods for *in vitro* testing of prosthesis and implants. Technologies for implants and prostheses – rapid prototyping and laser technologies. Partial and total locomotors prostheses. Cardiovascular prostheses. Hearing aid prostheses. Movable and resorbabile implants. Human visual system. Ocular orthosis – glasses, contact lens. Techniques for ocular prosthesis.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Biological systems	EPAPO	Romanian	6	2	-	1	2

Course description (Syllabus): biological systems, models and properties. Interfaces between biological systems and with the environment. Methods and devices for testing biological systems' properties.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Construction and maintenance of medical devices	CMAB	Romanian	6	2	-	1	2

Course description (Syllabus): Physical principles underlying the construction and operation of biomedical devices. Rules for the design, construction and testing biomedical devices. Standards in the field. Control of medical devices in operation. Parameters of reliability, maintainability and availability. Methods for reconditioning. The method of 5 M (Ishikawa diagram). Planning, management and implementation of maintenance.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Biomechanical systems' modelling and simulation	MSSB	Romanian	6	2	-	1	2

Course description (Syllabus): Modelling theory bases. Mechanical and biomechanical systems graphics and modelling. Basic concept in bones system modelling. Transformations. Kinematic and dynamic models. Hardware and software in biomechanical modelling and simulation. 3D models of biomechanical systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Programming environments for microcontrollers	MPMC	Romanian	5	2	-	2	1

Course description (Syllabus): Assembly languages for microcontrollers. Complex applications programming in assembler for the 8051 family of microcontroller. Organization of memory in command and control systems. Addressing the using external ports. Guidance with microcontrollers of liquid crystal display with text and graphics. The PWM (Pulse Width Modulation) command. Data acquisition with microcontroller. Remote control applications with microcontroller. Interfaces Serial-to-Ethernet. Programming environments for top-level 8051. Making applications in MikroC. Implementation of user interfaces in Visual Basic, for command and control from PC with the microcontroller systems.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
CAD/CAM for medical apparatus	CMAB	Romanian	5	2	-	2	1

Course description (Syllabus): FEM modeling principles. Structures analysis: beams, membranes and shells. Mesh elements for structures. Matrix assembling and solutions. Results treatment. Dynamic analysis. Design of specific classes of biomechanical systems components and parts.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Marketing and management	MKMG	Romanian	3	1	1	-	-

Course description (Syllabus): Basics in management. Modern organization. The manager and the functions of managing process. Profile and personality of the manager. Special problems of management. Basics in marketing. Quantitative and qualitative researches in marketing.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Biomedical systems mechatronics	MTSB	Romanian	5	2	-	3	-

Course description (Syllabus): Introduction. Biomechanical systems. Mechatronics in systems determining the kinetic and cinematic parameters of the human body. Mechatronics in systems for investigation and rehabilitation. Circulatory and respiratory apparatus. CNS. Electrocardiography. Electroencephalography. Spirometry.

Course title	Code	Language of instructionn	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Medical equipment automation	AEM	Romanian	4	2	-	2	-

Course description (Syllabus): actuation system basics. Medical systems automatization: surgery, dentistry, rehabilitation, vision devices and clinic testing.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Rehabilitation engineering	IR	Romanian	4	2		2	

Course description (Syllabus): Living matter. The basic structure of the human cell. Physiological processes. Polarization/depolarization. Excitability. Electrotherapy. Rehabilitation equipment and tools. Equipment for physiotherapy. Equipment for occupational therapy. Rehabilitation gym. Machinery, equipment and tools for maintenance and training. Apparatus and equipment for locomotors training.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Prosthetic engineering II	IR	Romanian	4	2		2	

Course description (Syllabus): total and partial locomotor prosthesis. Technologies for prosthesis and implants. Methods and techniques for visual prosthetics. Techniques for *in vitro* testing of prosthesis and implants. Standards for *in vitro* testing of prosthesis and implants.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Intensive care apparatus	APTI	Romanian	5	3	-	2	-

Course description (Syllabus): Anesthetic substances dynamics. Apparatus for inhalation anesthesia. Artificial ventilation devices. Auxiliary instruments. Manual surgery instruments. Electric/pneumatic surgery instruments. Devices for positioning the patient in surgery. Maintenance and sterilization of surgery anesthetic instruments. Apparatus for supplying the function of the kidney and lungs. Cardiac stimulation apparatus.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Surgery equipment	BO	Romanian	5	3	-	2	-

Course description (Syllabus): Anesthesia process. Devices for inhalator general anesthesia. Auxiliary devices for inhalator general anesthesia. Surgical instruments: manual acted, nonconventional, electrosurgical, with laser, ultrasounds etc. Design, construction and adaptation of apparatus for intensive care. Entertainment and sterilization of anesthesia apparatus and of surgical equipment.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Evaluation and certification of biomedical apparatus	ECAB	Romanian	4	2	-	2	-

Course description (Syllabus): Legal general dispositions concerning the exploitation, evaluation and certification of biomedical equipment. Certification authorities for products, management certification, operators Inspection authorities. Laboratories accreditation authorities. Medical devices standards. Competence of the conformity evaluation.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Data bases and statistics	BDPS	Romanian	4	2	-	2	-

Course description (Syllabus): Introduction in data bases. Working with tables, introduction in relational theory. Descriptive statistics. Variation analyzer. Introduction in Weibull. Reliability analyze. EpiInfo. Statistic software R and the correspondent data bases. Data bases in medical structures administration.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Thematic project (10 weeks×2 hours + 4 weeks×28 hours)	PTEM	Romanian	2	-	-	-	2

Course description (Syllabus): Medical devices. Prostheses and orthoses. Systems to assist people with special needs.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practical stage for diploma project	PRAC3	Romanian	3	-	-	-	30 hours ×2 weeks

Course description (Syllabus): Medical devices. Prostheses and orthoses. Systems to assist people with special needs.