

**Bachelor program,
Instrument Engineering (INEN) program, “Instrument Engineering” department**

Course Unit Title	Design of biomedical systems	
Course Unit Code	VTES-B05-3	
Type of Course Unit	Compulsory	
Level of Course Unit	4 th year INEN program	
National Credits	0	
Number of ECTS Credits Allocated	7	
Theoretical (hour/week)	2	
Practice (hour/week)	2	
Laboratory (hour/week)	2	
Year of Study	4	
Semester when the course unit is delivered	7	
Course Coordinator	Timur Aliyev	
Name of Lecturer (s)	Timur Aliyev	
Name of Assistant (s)	-	
Mode of Delivery	Face to Face, Seminar.	
Language of Instruction	English	
Prerequisites	-	
Recommended Optional Program Components	-	
Course description:		
<p>The problem of creating a modern electronic device or system for medical research is multifaceted and has several aspects, each of which can significantly affect the technical characteristics and design solutions used by the developer. These aspects are associated with the biological substantiation of the method, the methodology for its application, the techniques of its technical implementation and engineering techniques that determine the constructive and ergonomic design of the device or system. Electronic design is based on the use of various standards, regulatory and technical documentation, reference materials, requirements, etc. The ability to be guided by such documents when performing all stages of design work is a mandatory requirement for a specialist designer.</p>		
Objectives of the Course:		
<p>This course introduces the students to the basic design concept, design requirements, design specifications, evaluation, design validation, regulations, liability, and safety, The implementation of engineering design principles in solving biomedical problems using the student's background in engineering and biomedicine with an emphasis on biomedical instrumentation circuit design to solve presented problems.</p>		
Learning Outcomes		
At the end of the course the student will be able to		Assessment
1	Prepare documentation based on needs identification and specification preparation.	1,3
2	Evaluate the design aspects of biomedical equipment and its safety.	1,2,3
3	Identify steps in the verification and validation of the product design	1
4	Assess the quality control and performance in manufacturing supply chain	1
5	Familiarise with the standards and regulations for medical devices	1,3
Assessment Methods: 1. Final Exam, 2. Presentation, 3. Midterm exam		
Course's Contribution to Program		
		CL
1	Ability to develop as a specialist in the field of fundamental sciences and apply basic knowledge.	3
2	Ability to analyze and model functional and structural schemes of various purpose devices and systems.	5
3	Ability to use modern methods and tools, creation, selection, and application of engineering and information technology tools and modern devices and equipment.	5
4	The ability to use the strategy of team cooperation in the exchange of information, knowledge, and experience to achieve the set goal.	4
5	As a result of training, the ability to use engineering knowledge, mathematical models, and basic concepts of physics and chemistry in production and technological processes, automation, measurement, and control systems.	5
6	The ability to use modern software to process technical documents of devices, design their structures, and algorithmize processes.	4
7	The ability to apply artificial intelligence to improve the quality characteristics of measurement and control systems.	4

8	The ability to process information acquisition, processing, and transmission processes based on schematic and programmable logical integrated circuits.	4	
9	Ability to use knowledge to improve quality indicators and environmental safety of production processes.	5	
10	Self-development ability to apply theoretical and experimental knowledge in solving modern engineering problems.	5	
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)			
Course Contents			
Week	Chapter	Topics	Exam
1	[1]: Chapter 1	Introduction to Biomedical Engineering Design	
2	[1]: Chapter 2	Fundamental Idea Generation Techniques, Process Analysis Tools, and Evaluation Methods	
3	[1]: Chapter 3	Design Team Management, Reporting, and Documentation	
4	[1]: Chapter 4	Product Definition	
5	[1]: Chapter 5	Product Documentation	
6	[1]: Chapter 6	Product Development	
7	[1]: Chapter 7	Hardware Development Methods and Tools	Midterm
8	[1]: Chapter 9	Human Factors	
9	[1]: Chapter 11	Biomaterials and Material Testing	
10	[1]: Chapter 12	Risk Analysis: Devices and Processes	
11	[1]: Chapter 13, 14	Testing and Analysis of Test Data	
12	[1]: Chapter 18	Biological Engineering Designs	
13	[1]: Chapter 19	International Regulations and Standards	
14	[1]: Chapter 20	Intellectual Property: Patents, Copyrights, Trade Secrets, and Licensing	
15	[1]: Chapter 21	Manufacturing and Quality Control	
16			Final
Recommended Sources TEXTBOOK(S) 1. Paul H. King, Richard C. Fries, and Arthur T. Johnson. (2019). Design of Biomedical Devices and Systems. Fourth edition. CRC Press. Taylor & Francis Group, LLC.			
Assessment			
Attendance	0%	At least 75% class attendance is compulsory	
Presentation	10%		
Quiz	5%		
Lab. works	10%		
Course work	10%		
Midterm Exam	15%	Written Exam	
Final Exam	50%	Written-Oral Exam	
Total	100%		
Assessment Criteria			
Final grades are determined according to the Academic Regulations of Azerbaijan State Oil and Industry University for Undergraduate Studies			
Course Policies			
<ul style="list-style-type: none"> Attendance of the course is mandatory. Late assignments will not be accepted unless an agreement is reached with the lecturer. Students cannot use calculators during the exam. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Azerbaijan State Oil and Industrial University General Student Discipline Regulations 			
ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including midterm)	15	6	90
Presentation	1	10	10
Tutorials	15	1	15
Preparation for midterm exam	1	10	10
Final Examination	1	3	3
Preparation for final exam	1	22	22
Self-study	15	4	60
Total Workload			210

Total Workload/30(h)	210/30
ECTS Credit of the Course	7