Bachelor program,
Instrumentation engineering (INEN) program, "Instrumentation engineering" department

Course Unit Title	Computer-based instrumentation engineering
Course Unit Code	VTSS-B13
Type of Course Unit	Compulsory
Level of Course Unit	2nd year INEN program
National Credits	5
Number of ECTS Credits Allocated	5
Theoretical (hour/week)	1
Practice (hour/week)	2
Laboratory (hour/week)	-
Year of Study	2
Semester when the course unit is delivered	3
Course Coordinator	Aliyev Kamran
Name of Lecturer (s)	Aliyev Kamran
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

This course provides a comprehensive introduction to computer-aided design (CAD) techniques tailored for instrumentation engineering. Students will develop the ability to create accurate 2D and 3D models of complex instrumentation systems using industry-standard CAD software. Through hands-on projects, students will learn to design, simulate, and visualize instrumentation components, improving both their technical precision and their ability to communicate designs effectively.

Objectives of the Course:

By the end of this course, students will gain proficiency in creating precise 2D CAD drawings and complex 3D models of instrumentation systems using advanced CAD tools. They will apply parametric modeling for adaptable designs and perform CAD-based simulations to analyze system performance. Students will enhance visualization techniques for effective communication through rendered images, animations, and exploded views, and will produce professional-quality documentation, including technical drawings and client-ready presentations.

Learning Outcomes

At the end of the course the student will be able to		Assessment
1.	Develop the Ability to Create Accurate 2D Drawings: Gain proficiency in creating precise 2D technical drawings of instrumentation systems, focusing on the correct representation of schematics, wiring layouts, and system diagrams using CAD tools.	1,3
2.	Master 2D Detailing for Instrumentation Systems: Learn advanced techniques for dimensioning, annotating, and detailing 2D CAD drawings to ensure they meet engineering standards for manufacturing and assembly.	1,2,3
3.	Improve 3D Modeling Skills for Complex Designs: Build skills in creating detailed and complex 3D models of instrumentation components, focusing on both functional and aesthetic aspects of the design to ensure compatibility and manufacturability.	2,3
4.	Parametric 3D Modeling for Custom Instrumentation Designs: Develop expertise in parametric 3D modeling techniques, enabling the creation of customizable and adaptable	2,3

	instrumentation systems that can be quickly modified to meet varying design requirements.	
5.	Enhance Visualization Techniques for Design Creation: Learn to use CAD tools for better visualization of designs, including rendering, creating exploded views, and producing animations to effectively communicate complex designs to stakeholders.	1,3
6.	Improve Presentation and Documentation Methods: Develop skills to present and document 2D and 3D CAD designs, focusing on generating technical drawings, assembly instructions, and presentation materials for engineering teams and clients.	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.	4
2	Ability to analyze and model functional and structural schemes of various purpose devices and systems.	3
3	Ability to use modern methods and tools, creation, selection, and application of engineering and information technology tools and modern devices and equipment.	4
4	The ability to use the strategy of team cooperation in the exchange of information, knowledge, and experience to achieve the set goal.	5
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.	4
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.	1
8	The ability to process information acquisition, processing, and transmission processes based on schematic and programmable logical integrated circuits.	3
9	Ability to use knowledge to improve quality indicators and environmental safety of production processes.	4
10	Self-development ability to apply theoretical and experimental knowledge in solving modern engineering problems.	4
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		
Course Contents		

Week	Chapter	Topics	Exam
1	[1], Ch. 1, p.1-6;	LECTURE: Basic Concepts of AutoCAD SEMINAR - Basic concepts of computer-based Instrumentation engineering	
2	[1], Ch. 1	LECTURE: - SEMINAR - AutoCAD software access and dashboards	
3	[1], Ch. 2;	LECTURE: Intro to AutoCAD 2D SEMINAR - Basics of AutoCAD 2D	
4	[1], Ch. 2, p.1;	LECTURE: - SEMINAR - Basic modification tools	
5	[1], Ch. 2, p.2;	LECTURE: Modding tools	

		SEMINAR - Drawing accuracy	
6	[1], Ch. 2, p.3;	LECTURE: - SEMINAR - Improved modding tools	
7	[1], Ch. 2, p.4;	LECTURE: Editing tools SEMINAR - Improved editing methods	Midterm
8	[1], Ch. 7, p.3;	LECTURE: - SEMINAR- Editing Methods	
9	[1], Ch. 7, p.3;	LECTURE: Intro to AutoCAD 3D SEMINAR - Introduction to 3D Modeling in AutoCAD	
10	[1], Ch. 8, p.1-5;	LECTURE: - SEMINAR - Advanced Annotation Tools	
11	[1], Ch. 9, p.1-7;	LECTURE: -AutoCAD 3D subsections SEMINAR - Advanced Annotation Tools	
12	[1], Ch. 10,	LECTURE: - SEMINAR - Improved 3D Modeling methods	
13	[2], Ch 15;	LECTURE: Surfaces and Mesh SEMINAR - Working with Surfaces and Mesh	
14	[2], Ch 15, p.11;	LECTURE: - SEMINAR - Instrumentation engineering in AutoCAD 2D environment	
15	[2], Ch 16, p.1-4;	LECTURE: Applying AutoCAD to Instrumentation SEMINAR - Instrumentation engineering in AutoCAD 3D environment	
16			Final exam

Recommended Sources

TEXTBOOK(S)

1. Wilson R. Nyemba, Computer Aided Design Engineering, Design and Modelling Using AutoCAD 2023, Taylor and Francis
2. James D. Bethune, David Byrnes Engineering Graphics with AutoCAD® 2023, Pearson Education

Assessment

Attendance	0%	Less than 75% class attendance results in NA grade
Presentation	10%	
Lab	10%	
Quiz	10%	
Midterm Exam	20%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of Azerbaijan State Oil and İndustry University for undergraduate studies

Course Policies

1. Attendance of the course is mandatory.
2. Material presented in the lecture as well as assigned readings will be included in testing.
3. Late assignments will not be accepted unless an agreement is reached with the lecturer.
4. Cheating and plagiarism will not be tolerated.
5. 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	15	3	45
Presentation	1	10	10
Self-study	15	4	40
Tutorials	15	4	45
Midterm Examination	1	3	3
Preparation for midterm exam	1	10	25
Final Examination	1	3	3
Preparation for final exam	1	20	30
Total Workload			156
Total Workload/30(h)			5.03
ECTS Credit of the Course			5