Instrumentation Engineering (INEN) program, "Instrumentation Engineering" department

Course Unit Title	Quality Control and Metrology
Course Unit Code	VTSS-B14
Type of Course Unit	Elective
Level of Course Unit	3 th year INEN program
National Credits	0
Number of ECTS Credits Allocated	7
Theoretical (hour/week)	2
Practice (hour/week)	1
Laboratory (hour/week)	2
Year of Study	3
Semester when the course unit is delivered	6
Course Coordinator	Hasanova Gunay
Name of Lecturer (s)	Hasanova Gunay
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

Modern information measurement systems are computerized data collection and processing facilities used in scientific experiments and production control, environmental protection, medicine, and other areas. Information-measuring systems include systems for measuring, optimizing, measuring, and improving the metrological characteristics of systems for measuring, automatic control, technical diagnostics, and object recognition systems.

Objectives of the Course:

The main objective and purpose of the course are to teach future instrumentation engineers the design, and operation of information-measuring systems, and to evaluate and improve the structure, and performance of information-measuring systems and their metrological characteristics.

Learning Outcomes

At the end of the course the student will be able to		Assessment
1.	The participants have a thorough knowledge and an in-depth understanding of the modern-information measurement systems. Classification of data acquisition systems.	1,3
2.	Understand the signal conditioning and noise reduction techniques within the context of the information measurement systems.	1,2,3
3.	Understand the analog to digital, digital to analog conversion techniques and sample and hold circuits within the context of the information measurement systems.	2,3
4.	Understand the principles of SCADA and telemetry systems within the context of the information measurement systems.	2,3
5.	Understand HART and Modbus protocols as well as fieldbust communication systems within the context of the information measurement systems.	1,3
6.	Establish interface between the microcontrollers and sensors	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]: Chapter 1, p.2-4 [1], Ch. 1;	**LECTURE**: Basic terms and definitions of metrology.	
2	[2]: Chapter1. p.17-27	**LECTURE**: Physical quantities and their units of measurement	
3	[1]: Chapter 1.3, p. 5-6	**LECTURE**: Methods of measurement.	
4	[1]: Chapter 1.6, p.12-13	**LECTURE**. Errors in measurement	
5	[2]: Chapter 3, p.33-40	**LECTURE**: Evaluation of random errors.	
6	[3]: Chapter 1, p.12-17;	**LECTURE**: Basic information about standardization	
7	[4], Ch. 1 p 1-13	**LECTURE**:. Quality Control	Midterm
8	[5], Ch.	**LECTURE**: The concept of Six Sigma	
9	[2], Ch. 12, p.3;	**LECTURE**: Methods of Digital-to-Analog Conversion	
10	[5], Ch. 2, p.1-7;	**LECTURE**: Quality measurement.	
11	[5], Ch 2, p.8-11	**LECTURE**: Types of quality control. **LAB**- Development of a Capacitive Touch Sensor System	
12	[7], Ch 1, p.2-17,	**LECTURE**: Statistical quality control	
13	[6], Ch 15, p.10;	**LECTURE**: HART protocol	
14	[6], Ch 15, p.11;	**LECTURE**: MODBUS protocol	
15	[6], Ch 16, p.1-4;	**LECTURE**: Fieldbus Communication	
16			Final exam

Recommended Sources

TEXTBOOK(S)

1. 1.Department of mechanical engineering school of mechanical engineering. Sathyabama institute of science and technology.www.sathyabama.ac.in
2. Engineering Metrology. Department of Manufacturing Engineering and Production/Modern Academy in Maadi
3. A World Built on Standards – A Textbook for Higher Education Copyright: Danish Standards Foundation 2015 Distribution allowed.

4. Introductıon to qualıty assurance and control/Tishk International University 9/11/2023/
5. https://iipmi.org/wp-content/uploads/2020/06/Level-4-Production-and-Operations-Management.pdf
6. College of Natural Sciences Department of Statistics. Course title: Statistical Quality Control Lecture Note/ April: 2020/2021

Assessment

Attendance	0%	Less than 75% class attendance results in NA grade
Presentation	10%	
Lab. works	10%	
Course work	0%	
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 (including midterm)	15	5	75
Presentation	1	10	10
Self-study	15	4	60
Tutorials	15	4	60
Midterm Examination	1	3	3
Preparation for midterm exam	1	10	10
Final Examination	1	3	3
Preparation for final exam	1	20	20
Total Workload			241
Total Workload/30(h)			8.03
ECTS Credit of the Course			8