Fan name	Metrology and standardization . *4 ECTS*
Subject/module code	MS1404
Science teachable semesters	4th semester
Attached teacher	Rakhmonov Furqat Abduhakimovich, head teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Study hours (including independent learning)	**Total hours - 120.** **Auditory training hours -48.** Lecture training hours - 24 Laboratory training hours - 12 Practical training hours - 12 **Independent education -72 hour**
ECTS	4
Science goals and objectives / learning outcomes	**The goal of teaching science is** to form and develop logical thinking and technological thinking in students, to teach them to clearly state their opinions and conclusions in a well-founded manner, and to include them in the content of science. **The task of science.** Within the framework of the issues to be addressed in the process of mastering the subject "Metrology and Standardization", the bachelor: - should know the types of measurements and test methods for evaluation; types of measurement systems developed in enterprises, their differences; types of audits and their procedures; procedures and stages of standardization of quality systems; procedures for inspection and control of standardization regulatory documents systems and the selection and use of international standards for specific conditions in these activities; - the student must have the skills to understand the requirements of the standards used in standardization; to organize the measurement system on a technical and economic basis based on the specifics of the product production technology; to understand and calculate production modes in the standardization of the measurement system; to correctly identify the objects of the system of regulatory documents taking into account technological parameters; It is important for students to master the subject of "Metrology and Standardization" to use advanced and modern teaching methods and introduce new information and pedagogical technologies. **Learning outcomes:** 1. " Metrology " and standardization ” science studies its development, history and prospects. 2. " Metrology " and standardization ” describes the concepts of science 3. " Metrology" and standardization ” can apply qualitative and quantitative methods of science 4. " Metrology" and standardization ” the basic standards of science describes and can explain the difference between 5. " Metrology" and standardization ” can analyze the properties of science. 6. " Metrology" and standardization ” the basic laws and rules of science can explain. 7. " Metrology" and standardization ” one of the sciences how many methods hand takes . 8. " Metrology" and standardization ” can analyze the use of science in the field.
Course content (topics)	**I. Home theoretical part (Lecture)**

Subject 1: Introduction . Metrology and standardization science goal and tasks . Measurements unity provision system .

Subject 2: Of greatness size . Metrology in the field used main terms and definitions .

Subject 3: Metrological supply about concept . Metrological of supply goal and tasks .

Subject 4: Measurement of tools type confirm . Measure of tools metrological descriptions .

Subject 5: Measurement tools comparison . Measurement sectors .

Subject 6: Uzbekistan Republic of Standardization system . Standardization system goal and tasks ..

Subject 7: Uzbekistan To standardize in the Republic circle normative documents Categories and their designation . Stages of development of regulatory documents.

Subject 8: Standardization main regulations . Standardization about law essence .

Subject 9: Standards and measurement tools over state control . State metrological inspection and control application fields and objects .

Subject 10: Standard confirmation and state from the list transfer . Product create and working to release organization system .

Subject 11: Standardization advantage aspects of standards to oneself typical Features . Standardization system .

Subject 12: Standardization methods

II. Guidelines and recommendations for organizing laboratory exercises.

In laboratory classes, students develop practical skills and competencies in conducting experiments, calculating and drawing tables and graphs. The recommended topics are selected based on opportunities and conditions.

Suggested topics for laboratory work:

1. Stangen tools with measurement their work to do .
2. Micrometric tools with measurement their work to do .
3. Ammeter and voltmeter from comparison transfer
4. Sound level meter device elements.
5. Ultrasonic thickness gauge for metal and plastic. (Leeb 332) device elements.
6. Elements of the ultrasonic flaw detector CTS-9008 PLUS device.

III. Practical for training instructions and recommendations

The teacher's preparation for a practical session begins with studying the initial documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical session, as well as the amount of work that each student must perform.

Methodological guidelines are the teacher's main methodological document in preparing and conducting practical classes.

The goal of practical training is to understand theory and acquire skills. Its conscious application in educational and professional activities consists in developing the ability to confidently formulate one's own point of view.

Recommended practical topics :

1. Metrology in the field used main terms and definitions essence .
2. Metrological of supply main purpose .
3. Calculation of conditions of open electrical networks
4. Standardization system about main information place .
5. Standards and measurement tools over state control importance .
6. Standards confirmation and state from the list transfer order .

IV. Independent study and independent work.

Independent learning competence serves to support students'

	independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form. **Recommended topics for independent study:** 1. Study the basic concepts and definitions of metrology. 2. Measurement types . 3. Studying standards, their types, development procedures, approval and registration procedures. 4. Study of standardization methods. 5. Study certification schemes. 6. Standardize and codify product information. 7. International organizations for metrology and standardization. 8. Metrology and metrological support 9. Modern measuring instruments and their descriptions 10. Estimating measurement uncertainty . 11. Ensuring the uniformity of measurements and standards . 12. Technical regulations and their development 13. The role and importance of standards in quality management 14. Certification and its legal and regulatory support . 15. Certification process in the release place .
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean’s office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean’s office. After completion of the final work, the work is immediately encrypted by a representative of the Dean’s office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc.

Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects.

MIDTERM CONTROL

Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.

Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge

5 grade	100 points		Assessment criteria
5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand,

			know, express, and narrate the essence of the subject, and have an idea about the subject.
4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.
3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.

Course assessment criteria and procedure

Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
		Student activity (in seminars, practical, laboratory classes)	10 points	
Midterm assessment	20 points	Supervision: Written work	10 points	12 points
		System tasks	10 points (divided by the number of tasks)	
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points

* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.

Recommended Literature

Main literature:

1.Badalov.NJ . Metrology and standardization.Textbook.2023.303 pages.

2. Ismatullaev PR, Matyakubova PM, Turaev Sh.A. Metrology , standardization and Certification . Textbook . “ Lisson -press”, Tashkent, 2015. -423p.

3.Abduvaliev AA, Latipov VB, Umarov AS and Dr. Basic standardization, metrology, certification and quality control. - T.: NIISMS 2007. - 555 p.

4. Ismatullaev PR, Kodirova Sh.A. Metrology Basics . Study manual . Tashkent, “ Tafakkur ” publishing house 2012. -304 pages.

5. Kadyrova Sh.A. , Jabborov H.Sh. “ Metrology” and from the subject of " standardization " educational-methodical complex , T.:2020

Additional literature:

6. Mirziyoyev Sh.M. Erkin and prosperous , democratic Uzbekistan state together build we will . Uzbekistan Republic President's to the

position to enter solemn to the ceremony dedicated High Assembly of the wards joint in the assembly speech . –T.: “ Uzbekistan ” NMIU, 2016. – 56 p.
7. Mirziyoyev Sh.M. Law priority and human interests provision – national development and people of well-being pledge . Uzbekistan Republic Constitution acceptance 24th anniversary of its creation dedicated solemn ceremonial lecture December 7 , 2016. – T.: “ Uzbekistan ” NMIU, 2016. – 48 p.
8. Mirziyoyev Sh.M. Buyuk our future brave and noble our people with together we will build . - T.: “ Uzbekistan ” NMIU, 2017. – 488 p.
9. Uzbekistan Republic further develop according to Actions strategy on . - T.: February 7 , 2017 , Decree No. PF-4947 .
10. Ismatullaev PR and etc. Metrology , standardization and Certification . Textbook . Tashkent , 2001, -360 p .
Abduvaliev A.A. i dr. "Basic standardization, metrology, certification and management of quality" Tashkent, NIISPS, 2007.
11. Ismatullaev PR, Kadirova SH.A., Umarova NS Methodological instructions for conducting practical training in metrology, standardization and certification. TDTU 2013.

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2.http:\\www.lex.uz – Uzbekistan Republic law documents information national base
3.http:\\www.standart.uz – “ O'zstandart ” agency
4.http:\\www.smsiti.uz - Standardization , metrology and certification scientific research institute
5. http :// www . easc . org . by – Mezhgosudarstvennyy Sovet po standardizatsii, metrologii i certifikatsii Sodrujestva Nezavisimyx Gosudarstv.
6.http:\\www.ziyonet.uz – Education portal
7.http:\\www.window.edu.ru - Whole Russia education portal
Abduvaliev AA, Latipov VB, Umarov AS Alimov MN, Khakimov O.SH., Khvan VI Standardization , metrology , certification , quality . – Tashkent: SMSITI, 2008. " Metrology " Basics of Education " manual . Ismatillaev R. Kadirova SH. Tashkent 2021. Metrology , standardization and certification AAQurbonov training manual 2018. Ismatullaev PR , Kadirova Sh.A. “ Metrology , standardization and "certification " subject training manual .