ASIIN Seal & EUR-ACE® Label

Accreditation Report

Bachelor's Degree Programmes
Information systems and technologies
Metrology, standardization and product quality management

Master´s Degree Programme
Intelligent engineering systems
Metrology, standardization and quality management

Provided by
Tashkent State Technical University

Version: 27 June 2025

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
BA 60610200 – Axborot tizimlari va texnologiyalari	Ba Information systems and technologies	ASIIN, EUR-ACE® Label	-	02, 04
MA 70711601 – Intellektual muhandislik tizimlari	Ma Intelligent engineering systems	ASIIN, EUR-ACE® Label	-	02, 04
BA 60711300 – Metrologiya, standartlashtirish va mahsulot sifati menejmenti	Ba Metrology and standardization	ASIIN, EUR-ACE® Label	-	01, 02
MA 70711302 – Metrologiya, standartlashtirish va sifatni boshqarish	Ma Metrology, standardization and quality management	ASIIN, EUR-ACE® Label	-	01, 02
Date of the contract: 11.06.2024 **Submission of the final version of the self-assessment report:** 11.10.2024 **Date of the onsite visit:** 05.-06.02.2025 **at: Campus Tashkent State Technical University**				
Expert panel: Prof. Dr. Rainer Tutsch, TU Braunschweig Prof. Dr. Ralf Müller, FAU Erlangen-Nürnberg Yuldashova Shakhnoza, Uzbekistan Accreditation Centre Abror Mamataliev, student at Tashkent University of Information Technologies				

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes

[2] TC: Technical Committee for the following subject areas: TC 01 - Mechanical Engineering/Process Engineering; TC 02 - Electrical Engineering/Information Technology; TC 04 - Informatics/Computer Science

Representative of the ASIIN headquarter: Johann Jakob Winter, M.Sc.	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of March 28, 2023 Subject-Specific Criteria of Technical Committee 01 – Mechanical Engineering/Process Engineering as of December 9, 2011, Technical Committee 02 – Electrical Engineering/Information Technology as of December 9, 2011, and Technical Committee 04 – Informatics/Computer Science as of March 29, 2018	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
BA 60610200 – Information systems and technologies	Axborot texnologiyalari muhandisi (UZB)/ Information technology engineer (ENG)	-	6	Full-time	-	4 years / 8 semesters	240 credits	annually since 2012
MA 70711601 – Intelligent engineering systems	Intellektual tizimlar muhandisi (tadqiqotchi-pedagog) (UZB)/ Intelligent systems engineer (researcher-pedagog) (ENG)	-	7	Full-time	-	2 years / 4 semesters	120 credits	annually since 2016
BA 60711300 – Metrology, standardization and product quality management	Metrologiya va standartlashtirish muhandisi (Uzb)/ Metrology and standardization engineer (Eng)	-	6	Full-time	-	4 years / 8 semesters	240 credits	annually since 1992
MA 70711302 – Metrology, standardization and quality management	Metrologiya, standartlashtirish va sifatni boshqarish sohasi mutaxassisi (tadqiqotchi-pedogog) (Узб) / Specialist in metrology, standardization and quality management (researcher-pedagogue) (Eng)	-	7	Full-time	-	2 years / 4 semesters	120 credits	annually since 1999

Tashkent State Technical University (TSTU, Uzbek: Toshkent Davlat Texnika Universiteti) is one of the oldest universities in Uzbekistan, founded in 1920. Currently, the university consists of 8 faculties offering 64 Bachelor's degrees and 76 Master's degree programs in the fields of engineering, geosciences and material science. Currently, about 21,500 students are enrolled at the university. In the QS World University Ranking, TSTU is ranked among the top 400 universities in Asia. According to the university staff, TSTU is the country´s

[3] EQF = The European Qualifications Framework for lifelong learning

leading technical university and a pioneer in the national higher education system, as multiple former faculties/ departments were established as own specialized universities over time. The four programmes under review are offered by the Faculty of Electronics and Automation.

A particular feature of TSTU is its widespread national network of industrial stakeholders which is closely involved in the strategic development of study programmes at the university, the content-wise orientation of individual programmes and modules, as well as in the teaching activities themselves by means of site visits, multiple internships, and guest lectures. As a result, all programmes offer a very standardized, application-oriented education which allows students to start working in relevant work positions already during their studies or directly after graduation. Aspects of the programmes which, as the experts note, come comparatively short and could be enhanced are the opportunities for individual specialization and international experience. Also, the focus on academic research is mostly contained in the Master´s programme while the Bachelor´s programmes only provide a basic introduction in this regard.

For the Bachelor's degree programme Information systems and technologies (BIST) the institution has presented the following profile on the programme´s website:

"The specialty information systems and technologies is a specialty in the field of science and technology, which covers research on methods of production system design, study operation of computer technologies and communication equipment, implementation of design processes using optimization methods, study complex set of issues related to the development of mathematical models of physical processes in computer and communication technology, learn algorithms and practical programs development for computer systems' efficiency and reliability evaluation, design and development of hardware and software systems, and their integration."

For the Master's degree programme Intelligent engineering systems (MIES) the institution has presented the following profile on the programme´s website:

"Intelligent engineering systems master's specialty is a education specialty in the field of "Engineering work", which teaches subjects related to specialty in all educational institutions, in the Academy of Sciences of the Republic of Uzbekistan and branch scientific research institutes, in state and economic management bodies, organizations related to scientific, technical and technological issues in the field of application, design, production and use of intelligent engineering systems in joint-stock companies, production enterprises, technological and design scientific-production institutions in the field of specialization, also includes set of tools, methods and methods of human activity aimed at ensuring technical, operational and economic safety, setting perspectives, professional skills, and authority

skills in the development of industries that design, manufacture and use intelligent engineering systems."

For the Bachelor's degree programme Metrology, standardization and product quality management (BMSQ) the institution has presented the following profile on the programme´s website:

"Metrology, standardization and product quality management (by industry) Bachelor's degree is a field of science and technology, production and service, metrology, technical regulation, standardization and compliance professional activities such as assessment, measurement, measurement methods and tools, product quality control, introduction of quality management system in enterprises and organizations, metrological supply in production enterprises, technical support of scientific and production activities includes the training of qualified specialists."

For the Master's degree programme Metrology, standardization and quality management (MMSQ) the institution has presented the following profile on the programme´s website:

"Training of highly qualified specialists for scientific and pedagogical activity in all educational institutions, in the Academy of Sciences of the Republic of Uzbekistan and branch scientific research institutes, in state and economic management bodies, in the scientific-research institute of standardization, certification and technical regulation, in the Technical Regulatory Agency and in its regional branches, certification offices and testing laboratories, metrological control and inspection, control of regulatory documents establishing requirements for ensuring the quality, safety and competitiveness of products, and scientific-production associations in the field of their implementation in various forms of industry and business organizations and production enterprises and organizations that use them cover a complex set of issues related to metrology, standardization, certification, technical regulation and quality management."

All four programmes are subject to international accreditation by ASIIN for the first time.

C Expert Report for the ASIIN Seal[4]

1. The Degree Programme: Concept, Content & Implementation

Criterion 1.1 Objectives and Learning Outcomes of a Degree Programme (Intended Qualifications Profile)

Evidence:

- Self-Assessment Report
- Study plans of all study programmes
- Objective-module matrices of all study programmes
- Module descriptions of all study programmes
- Diploma Supplements of all study programmes
- Websites of all study programmes
    - BIST: https://tdtu.uz/students/undergraduate4
    - MIES: https://tdtu.uz/students/judiciary5
    - BMSQ: https://tdtu.uz/students/undergraduate5
    - MMSQ: https://tdtu.uz/students/judiciary4
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The experts base their assessment of the learning outcomes on the information provided on the websites, the Diploma Supplements, the objective-module-matrices and in the Self-Assessment Report of the four degree programmes under review.

The experts refer to the Subject-Specific Criteria (SSC) of the Technical Committees Mechanical Engineering/ Process Engineering, Electrical Engineering and Information Technology and Informatics/ Computer Science as a basis for judging whether the intended competence profiles of the four programmes correspond with the competences as outlined by the SSCs. As all four programmes are interdisciplinary subjects, multiple SSC apply to them. The programmes in metrology refer to an interdisciplinary compound of basic natural

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

sciences, methodologies of measurement, and electrical engineering. On the other hand, BIST and MIES are application-oriented programmes containing a blended mix of the hardware aspects of electrical engineering, and the software aspects of informatics and programming.

The detailed description of the programme learning outcomes of all four degree programmes is displayed in the appendix below. Via objectives-module matrices, TSTU shows the interrelation of the individual modules with the learning outcomes. The experts note that the learning outcomes are listed in detail and regarding to different occupation areas. Although they deem this level of detail to be unnecessarily compartmentalized, they assess the learning outcomes to be reasonable and corresponding to the EQF level 6 for Bachelor´s degrees and EQF level 7 for Master´s degrees, respectively. They also confirm that the learning outcomes comply with the requirements formulated in the SSC of the Technical Committees 01, 02 and 04.

However, the experts point out that the number and wording of the learning outcomes as displayed in the diploma supplements, objective-module matrices, the programmes´ websites and the Self-Assessment Report differ. For some learning outcomes, multiple diverging descriptions are also used. Although these differences are not significant and either of these sets of learning outcomes would adequately reflect the qualification goals of study programmes in the respective fields, consistency in the documentation of the learning outcomes needs to be ensured. Moreover, the experts criticise that a number of learning outcomes are not formulated outcome-oriented, meaning that the formulation does not allow for an assessment whether the learning outcomes are fulfilled. The experts recognize that this might be due to translation problems, but still require TSTU to review the learning outcomes, formulate them in an outcome-based way and harmonize them across all official documents of the study programmes.

TSTU verifies the graduate profiles by means of a tracer study. The Self-Assessment Report contains a comprehensive table which outlines that about 98 % of the BIST and MIES graduates find suitable jobs across a broad field of occupations. Most of the graduates work in industrial production, found own businesses or work in banking, finance or similar service institutions. About 6 % of the Bachelor graduates continue their academic education. Out of the Master graduates, a significant share of 30 % works in higher education. For BMSQ and MMSQ graduates, the main occupational fields are in research, regulatory authorities, industrial production, and private enterprises.

During the on-site visit, the experts learn more about the close ties between the university and its extensive network of industrial stakeholders. They learn from the representatives of the Rector´s office that the intake of students is mainly based on analyses of the labour

market demand of the local and national industries and ministerial directions as prescribed in a 5-year plan. This leads to a neat transition of graduates into industrial positions. As both students and representatives of the industrial stakeholders explain, many active students already start working in companies where they completed their internships (see also section 1.3). Out of the students present in the respective interview session, more than 80% were working at least part-time. The experts positively regard this close connection of theory and practice and are satisfied that the graduate profiles of the students educated at TSTU are sought-after by the industry and lead to good employment opportunities.

Since TSTU also applied for the EUR-ACE® label, the experts check whether the learning outcomes are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG) for engineering programmes. The EUR-ACE® Framework Standards and Guidelines requires that engineering programmes cover the following seven competence areas: Knowledge and Understanding, Engineering Analysis, Engineering Design, Investigations, Engineering Practice, Making Judgements Communication and Team-working, and Lifelong Learning. The documents illustrate that the degree programmes under review cover all the required competence areas and the experts perceive during the audit discussions with teachers and students that the mentioned competences are conveyed in the respective courses. They conclude that the intended learning outcomes of all programmes are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG).

In terms of continuous review, the Self-Assessment Report explains that the competence profiles of the study programmes were developed by a development team including the programme coordinators, teachers, students, and relevant external stakeholders. Through the involvement of industry partners, the fit of the graduate profile and learning outcomes to the current labour market requirements shall be ensured. Likewise, industry representatives, higher education specialists, faculty members and students are also part of a regular review process of all programmes at least every 3 years. Examples of industrial stakeholders that have contributed to the programmes are the deputy chairman of the association "Uzelteksanoat" for BIST and MIES, and the director of the National Metrology Institute of Uzbekistan for BMS and MMSQ. Representatives of both institutions are also present during the on-site visit and confirm their respective involvement and the responsiveness of the university to their comments. During the on-site visit, the experts also learn that the actual review interval for the curriculum is even smaller as industrial stakeholders are invited to comment on their needs with respect to the graduate profiles and curricula every year. In this regard, TSTU always presents their latest changes in the curriculum and module contents and asks for feedback. Likewise, students can contribute to the programme development which goes hand in hand with the review of the industrial stakeholders. Curricular

changes are presented to the students in information sessions at the beginning of each semester.

In terms of recent adaptions in the programmes, TSTU mentions the strengthening of the quality management component of the BMSQ and MMSQ programmes to support the quality assurance and development in companies of Uzbekistan´s rising manufacturing sector. For BIST and MIES, recent changes concern a more extensive focus on aspects of artificial intelligence for boosting the digitalization process of the national industries. The experts are highly satisfied with the university´s stakeholder network and its incorporation into the development of the programme.

In summary, the experts confirm that the objectives and learning outcomes of the degree programmes are described briefly and that they are transparently published on the programmes´ websites and in the official study documents. Thus, they are available to students, lecturers and interested third parties. However, it appears that different formulations and explanations are used in different document, which needs to be revised and harmonized. In this regard, the experts point out that all learning outcomes need to be formulated in an outcome-oriented way to make their fulfilment measurable. Nevertheless, the formulations adequately reflect the targeted academic qualification goals of the respective SSC, and ensure a professional qualification on the level EQF 6 (for the Bachelor´s programmes) and EQF 7 (for the Master´s programmes). The objectives and learning outcomes are feasible to produce graduates with good job perspectives, as close stakeholder relations and an extensive review process ensure their relevance for both the labour market and society.

Criterion 1.2 Name of the Degree Programme

Evidence:

- Self-Assessment Report
- Websites of all study programmes
- Diploma Supplements
- Discussion during the audit

Preliminary assessment and analysis of the experts:

As the representatives of the Rector´s office explain, the programmes´ names were chosen in accordance with the State Standard of the Republic of Uzbekistan for titles of study programmes. According to the Self-Assessment Report, TSTU awards the degree of “Bachelor of technical sciences” for the Bachelor´s programmes and “Master of technical sciences”

for the Master´s programmes. Furthermore, graduates are allowed to use the following titles upon completion of the programmes:

- BIST: Information technology engineer (Axborot texnologiyalari muhandisi)
- MIES: Intelligent systems engineer (Intellektual tizimlar muhandisi)
- BMSQ: Metrology and standardization engineer (Metrologiya va standartlashtirish muhandisi)
- MMSQ: Specialist in metrology, standardization and quality management (Metrologiya, standartlashtirish va sifatni boshqarish sohasi mutaxassisi)

For the BIST programme, the experts internally discuss the feasibility of the very broad title which allows for multiple different interpretations of its contents. While “Information systems” is often used as a synonym for business informatics which refers to a combination of computer science and business administration, the second part of the title “and technologies” suggests a more technical electrical engineering component. A similar twofold spread of the title also applies to MIES. However, upon reviewing the modular contents of both programmes in detail, the experts gain the impression that the blended mix of both programming and engineering aspects of these programmes is captured adequately by these broad titles. Overall, the experts are satisfied and confirm that the titles of all four study programmes adequately reflect their learning outcomes and teaching contents.

Also, as the experts learn during the on-site visit, the programmes official titles have recently been modified, which explains the partly contradictory formulations contained in the Self-Assessment Report as well as the corresponding documentation. Until the past academic year, the programmes titles were the following:

Title (in Uzbek)	***Title (in English)***
Axborot tizimlari va texnologiyalari (sanoat ishlab chiqarishida)	Information systems and technologies (by industry)
Intellektual muhandislik tizimlari (tarmoqlar va sohalar bo‘yicha)	Intelligent engineering systems (by branchs and sectors)
Metrologiya, standartlashtirish va mahsulot sifati menejmenti (tarmoqlar bo‘yicha)	Metrology, standardization and product quality management (by industry)
Metrologiya, standartlashtirish va sifatni boshqarish (tarmoqlar bo‘yicha)	Metrology, standardization and quality management (by industry)

Therefore, the experts are wondering about the meaning of "(by industry)" in the programmes names. TSTU explains that this used to be part of the state classification system and refers to the specialization for different industry branches the students can obtain in the programmes. However, currently, these name supplements have been removed from the titles.

The experts do not see any informative value in these supplements and, on the contrary, comment that this amendment of the titles is rather confusing from an international perspective. Also, even if industry- or branch-specific elective specializations were to be introduced in the curricula – which the experts do not see in the current versions – they do not deem it a sensible option to amend the titles in that way. Eventually chosen specializations would nevertheless be clearly outlined to potential interested parties in the Diploma Supplements. Therefore, the experts suggest to keep the short versions of the titles as they are and not to change them again, which is mentioned as an idea by TSTU. In this regard, as both the former long and the current shorter versions of the titles are to be found in different places and documents, the experts also require the university to consistently use the programme titles across all official documents as well as the programmes´ websites.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Curricular overviews of all study programmes
- Module descriptions of all study programmes
- Objective-module matrices of all study programmes
- Exemplary study schedule
- Ministerial regulation regarding the organization of educational process in higher education institutions on measures for improvement of the system
- Ministerial regulation on the "approval of the requirements for the performance of the final qualifying work of bachelors in higher educational institutions"
- Discussion during the audit

Preliminary assessment and analysis of the experts:

Structure and content

The experts base their assessment of the curricula on the curricular structures, as displayed in the appendix below, the module handbooks, as well as further supporting documentation as given in the Self-Assessment Report.

The two Bachelor's programmes have a duration of four years (8 semesters) and a credit load of 240 credit, corresponding to a total of 204 weeks of educative activities according to the Uzbek programme structure. The overall structure of the BIST and the BMSQ is the same and includes, as main components, 120 weeks of theoretical and practical training as well as 14 weeks of practical internships ("qualification practice"). The remaining time is reserved for an introductory week before the start of each semester, exam periods, the final state certification exams, administrative activities, and vacation.

According to the Self-Assessment Report, the curricula are generally developed based on a competency-based approach and include compulsory and elective subjects. About 77 % of the modules are compulsory and 23 % are elective module slots, for which the students can choose between two given options. In both programmes, there are elective options from the first semester on as outlined in the curricular overviews contained in the appendix.

Core elements of the BIST in the first year of study are "Mathematics", "Physics" and introductory subjects regarding computer engineering and programming. In the third and fourth semester, the focus is on "Computer systems and networks" as well as "Digital circuits". The third year widens the perspective of the programme by including modules like "Economics and Management", "Ecology" and "Control theory". Also, a series of "Big Data" modules starts in this semester. Besides big data, the final year of study contains modules such as "Discrete and digital control systems", "Identification and evolutionary modelling" as well as an elective focussing on information security or cyber security.

In the BMSQ, the first year contains basic modules like "Mathematics", "Physics", "Chemistry", and modules introducing the subject of metrology. Based on that, the higher semesters focus on "Measuring methods and tools", "Basics of metrology" and "Basics of standardization", as well as legal frameworks for these fields, each covered with 2 or 3 modules. Like in BIST, different module slots offer a broadening of the application perspectives, while the final year´s focus is on different aspects of quality management and control.

Besides these core modules, the curriculum also contains several modules with general educational purpose, among others „Contemporary History of Uzbekistan", "Uzbek language", two foreign language modules, and a philosophy module, spread over the entire

duration of the curriculum. Moreover, three “Qualification practice” modules are included in the fourth, sixth, and eighth semester which contain work practice in related industries and the completion of a project under the supervision of a teacher. The total length of the different work practices is 14 weeks. The experts highlight this structured integration of multiple practical internships as a strength of the programmes´ curricula.

According to the Self-Assessment Report, the final component of both Bachelor´s programmes is a graduate thesis. The experts are satisfied with the samples provided during the on-site visit but wonder why the thesis is not contained in the curricular overviews of the programmes nor described in the module handbooks (see also section 2 for more details). In this regard, the experts point out that all mandatory parts of the curricula must be clearly outlined and credited accordingly.

On the other hand, the two Master’s programmes have a duration of 2 years (4 semesters), for which an equivalent of 104 weeks is calculated. The distribution of learning activities is as follows:

- 45 weeks of theoretical training and scientific activities,
- 7 weeks of scientific practice (internship)
- 12 weeks of preparation of research and Master's thesis
- 16 weeks of certification
- 3 weeks of entry into the credit education system
- (21 weeks – vacation)

Theoretical education and scientific activities are divided into 88% compulsory subjects and 12% elective subjects. Half of the programmes´ curricula is dedicated to research activities in the preparation of the Master´s thesis (“Scientific research work”) which is spread over the entire duration of both programmes as outlined in the module descriptions. The topics of the Master´s theses are determined by the university based on respective prospects for the development of related industries and research fields and are handed out to each student in the first semester.

Besides the thesis, the curricula require also a “Scientific pedagogic work” project. The experts wonder about this module and learn that Master´s students are mandatorily involved in teaching and tutoring activities for junior Bachelor´s students which is related to the learning outcome of achieving teaching skills to fulfil a potential graduate profile as lecturer. Besides their practical execution and assessment, the teaching activities need to be prepared and documented in a respective report. The experts raise the question of whether the students are paid for their contribution to covering the teaching load. The programme coordinators clarify that they are not paid, as this is part of the students´ curricular

workload as captured by the respective number of credits per semester. The experts generally welcome this active and guided integration of Master´s students into teaching activities.

Further compulsory modules deepen contents of the corresponding undergraduate programmes, like “Engineering systems imitation modelling” in MIES or “Theoretical foundations of automated and intellectual measuring instruments” in MMSQ. Both programmes contain two elective module slots in the first two semesters with two subject choices each.

As a general observation regarding the curricular structures of all four programmes, the experts note that several modules are spread over multiple semesters. While, in the curricular overviews, these modules are displayed as separate but consecutive modules (e.g. undergraduate modules “Higher mathematics 1”, Higher mathematics 2”, “Higher mathematics 3”), the module handbooks contain only one comprehensive description for the module “Higher mathematics” with the aggregate credit load of all partial modules and the information, that the module is taught in the semester 1-3. Therefore, the experts enquire about the organization of these modules and learn that they are split into different courses per semester with defined sets of teaching content. Moreover, the programme coordinators explain that each semester course also contains an individual exam grade, which pleases the experts. Thus, in case of failure of an exam, students have to retake only the exam for the particular course and not the entire module. However, the experts point out that this structure is not reflected in the module handbooks as neither the contents nor examination forms, prerequisites or related information are differentiated for each semester which is crucial for all stakeholders, including students, teaching staff and interested third parties to know about the modules. Therefore, the experts require to outline each module concisely in the module handbook.

In that regard, the experts also recommend avoiding the use of generic module names like “Higher mathematics” which contain only little informative value in themselves. Instead, the module names should reflect the specific set of teaching contents as precisely as possible. As an example for one of the mathematics courses, the experts suggest the module title “Linear algebra”.

Related to this matter of interlinked modules, the experts also learn during the audit that the curriculum prescribes a fixed order in which the modules have to be taken and completed. According to the programme coordinators, there are strict ministerial regulations regarding this structure. While the experts assess this very regulated, school-like system as generally feasible, they explain that a more flexible approach which allows students the responsibility to take the modules in an order of their choice would benefit the students´ individual analysis of the curricular contents. Furthermore, this would help to avoid

problems in case students fail exams which are formally required as prerequisites to take advanced modules. They again employ the three-parted modules “Higher Mathematics” as an example, which, among others, contains the topics of linear algebra, differential equations, and probability theory. As these topics are largely independent from each other, there is no content-related necessity of teaching them in a specific fixed order. An important feature for realizing this kind of structure would be the definition of formal prerequisites and recommended prior knowledge in the module descriptions. Overall, however, the experts deem the curricular structure as adequate to fulfil the programmes´ learning outcomes, which is also confirmed by the industry representatives and students. The students opine that the prescribed sequence of modules is suitable as it starts with basic theory in the first semester while application-oriented and more specific modules are contained in higher semesters.

While the experts are generally satisfied with the subject-specific compulsory course contents, they wonder about the elective course offer. The system employed by TSTU defines designated slots for elective modules in different semesters already from the first year of study on, which the experts generally welcome. For each elective slot, the students can choose between two options. However, the experts note that in most cases the elective choices are very similar. During the interview sessions with the teaching staff, they gather exemplary insights into the differences between certain elective choices, such as “Information security” and “Fundamentals of cybersecurity” in the BIST. However, they are still of the opinion that this structure does not really allow for individual focal points and courses of study of the students. In this regard, the experts recommend TSTU to offer more opportunities for individual specialization by offering a greater variety and more flexible choice of electives modules, which also goes hand in hand with the prior suggestion for a more flexible handling of the curriculum.

As a last question regarding the curricular structures, the experts ask for a more detailed explanation regarding the offered part-time study option which is only briefly mentioned in the Self-Assessment Report. They wonder how this a part-time concept can work given the fixed curricular structure mentioned above. It is explained that this offer exists only for the undergraduate programmes and is designed specifically for college students with prior vocational training. For them, the curriculum is spread over 5 instead of 4 years and the modules to be taken by them are arranged in specific time slots to ensure that still the entire curriculum will be covered.

Specifically related to both undergraduate programmes, the experts are happy to see that the curricula contain a foreign language module. However, the experts wonder about the name displayed in the module handbook which is “Foreign language/ English language”. Therefore, the experts enquire which foreign language is actually taught in this module or

whether multiple foreign languages are supposed to be learnt by the students. The programme coordinators explain that by the time of the preparation of the Self-Assessment Report and the corresponding documentation, the only offered foreign language was English. However, since the current academic year, students can choose between English, French, German, and Japanese as their preferred foreign language. The experts positively acknowledge this development but, again, point towards the problem of the untransparent module names. Each offered foreign language module needs to have a subject- and therefore language-specific module description including a singular module number and title that identifies the module.

Furthermore, the experts discuss several content-related matters of specific modules with the coordinators and the teaching staff of the programmes, e.g. the teaching contents of the module “Intelligent engineering systems” and whether image compression is contained in the module “Digital image processing” of the BIST programme. Overall, the experts are satisfied with the teaching staff´s explanations and gain the impression that many of the content-related questions and inconsistencies came up due to incorrect English translations of the module descriptions, especially in terms of subject-specific terminology. In this regard, the experts require TSTU to commission a professional translation of the module handbook (see also section 3.1). As one specific fault to be corrected the experts deem the lack of an introduction to the concept of Bayesian inference in both undergraduate programmes. The programme coordinators explain that this is contained in the Master´s level module “Research methodology” but the experts deem this concept crucial as basis also for Bachelor´s theses and therefore recommend TSTU to teach this concept already in the Bachelor´s programmes.

In summary, the experts confirm that the curricula of all programmes enable the students to achieve the respectively defined learning outcomes. They further conclude that the curricula of all programmes are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG). The structure of the programmes and order of the modules are sensible, and the experts specifically stress the close integration of theory and practice. The experts gain the impression that each module respectively course represents a well-matched unit of teaching and learning; however, this is for multiple modules not concisely outlined and defined in the module descriptions which needs to be corrected. In this regard, also the module titles should be more precisely adjusted to the contents of each module. Furthermore, the experts require the mandatory implementation of a Bachelor´s thesis for all undergraduate students and its respective documentation in the curriculum documents (see section 2). Also, the experts mention the little room for individual specialization, which is connected to the fixed curricular structure and module sequence, as a weakness of all

programmes. In this regard, they recommend offering a greater variety and more flexible choice of elective modules.

Internationalization and student mobility

According to the Self-Assessment Report, TSTU has partnership with multiple foreign higher education institutions. With these partners, student mobility activities such as exchanges and joint programmes are carried out.

Examples of partners of the Department of Information Processing and Control Systems which offers the BIST and MIES are Stankin Moscow State Technical University, Belarusian State Technological University, Khalifa University, University of Žilina, Kayseri University and Bagazici University of Turkey. From the undergraduate programme, 25 students have studied in Belarus and 10 students have studied in Russia so far. Since the academic year 2022/23, also Master´s students participate in student exchanges.

For the Department of Metrology and the programmes BMSQ and MMSQ, technical regulation, standardization and certification, examples of cooperation partners are Moscow Institute of Engineering and Physics, National Research Nuclear University (MMFI MTYaU), National Technical University of Belarus, N. E. Bauman Moscow State Technical University, Technical University of Dresden, Technical University of Berlin, and the University of Paris. It is explained in the Self-Assessment Report that, currently, 41 students of various years of the undergraduate programme study at the National Technical University of Belarus, while 6 Master´s students are completing exchange periods at the National Research Nuclear University in Moscow.

The experts are satisfied to see TSTU´s efforts for the establishment of student mobility offers which, in addition to the above-mentioned programmes, has resulted in recent MoUs with universities in Malaysia, Tajikistan, and Kazakhstan. During the on-site visit, the representatives of the Rector´s office also mention Erasmus-based projects together with universities in France and Italy, as well as a student exchange with Nagoja University in Japan and Khalifa University in UAE as recent achievements in terms of internationalization. In this regard, they enquire about the meaning of the so-called “1+1” and “2+2” programmes mentioned in the Self-Assessment Report. The programme coordinators explain that in these cooperation programmes half of the modules are to be completed at TSTU and half at the partner university. However, despite the joint offer of these programmes the students obtain their degree only from TSTU and, so far, only TSTU students are eligible for these programmes. The experts encourage TSTU to continue actively seeking also incoming student mobility as a means of internationalization. As one measure in this regard the experts see the precise definition of required/ recommended prior knowledge for each

module in the module descriptions to allow students from other universities to assess which modules they can take.

However, considering these recent improvements of the opportunities for students to go abroad, the experts are surprised that the interest of the students go abroad for certain periods of their studies appears to be limited. The experts believe that one reason for this situation may be that, as a result of the practice-oriented education and the close industry contacts, a high share of the active students are already working at least part-time in jobs related to their fields. None of the students present in the respective interview sessions has taken part in mobility activities and the experts gain the impression that outbound student mobility is comparatively unpopular among the students of the concerned programmes. As the experts consider students mobility as one of the bases for academic exchange and the internationalization of the university, they recommend TSTU to actively encourage the students to go abroad for parts of their studies and further develop the support system for student mobility. Nevertheless, as the students confirm to know fellow students who went abroad as well as incoming students studying together with them, the experts are generally satisfied.

According to the Self-Assessment Report, provisions for the recognition of achievements obtained at other universities are based on the ministerial regulation regarding the organization of educational process in higher education institutions on measures for improvement of the system. However, as the experts do not find any clearly outlined regulations for the recognition of externally achieved credits, they raise this question during the on-site visit and learn that the university flexibly handles the recognition of similar subjects based on the Transcript of Records of the other university (see also section 1.4).

In summary, the experts confirm that TSTU promotes student mobility through an appropriate framework, which is currently being further developed.

Periodic review

According to the Self-Assessment Report, the curricula are reviewed periodically at least every three years in an extensive process that involves relevant stakeholders, as explained also in section 1.1. The following table taken from the Self-Assessment Report lists recent adaptions in all four programmes:

№	Educational programs	Year of introduction	Subject name	Purpose of introduction
1	60610200 – Information systems and	2021	Big data	It forms the skills of students to sort the necessary knowledge based on the algorithms of analysis of large volumes of data and to reduce the human

	technologies (by industry)			factor in finding an optimal solution to the problem, as well as to use modern technologies.
		2021	Web technologies	Today, the field of remote services is developing rapidly, and web technologies, which form the basis of this, are widely penetrating all fields. Taking this into account, it was introduced to form students' skills in working with modern web technologies.
		2023	Algorithmic languages and programming	Development of algorithms for solving various technical or economic problems and formation of students' skills in writing their programs using programming languages.
2	60711300 – Metrology, standardization and product quality management (by industry)	2021	Basics of conformity assessment	Analyzes the requirements of the international standard ISO 17000 series related to the field of conformity assessment, students are trained on the requirements of product and service certification bodies and testing and calibration laboratories.
		2019	Uncertainty of measurements in science and technology	Measurements in science and technology, methods of estimating measurement uncertainty, analysis of metrological characteristics of measuring instruments, their effective use in concrete conditions, practical application of measurement uncertainty, measurement uncertainty will have practical application skills.
		2021	Elements of the measuring device	Study, analyze and calculate the principle of operation of measuring devices, what elements they are made of, the properties of these elements, the principles of operation and the interrelationship between them. It consists in forming knowledge about the elements of modern measuring devices.
		2021	Legal basis of metrology, standardization and certification	Metrology consists of forming the ability to study and analyze technical regulation, standardization and conformity assessment and other regulatory legal documents.
3	70711601 – Intelligent engineering systems (by branchs and sectors)	2022	Artificial intelligence methods and technologies	Formation of students' skills to work with artificial intelligence systems, taking into account the concept of "Digital Uzbekistan-2030" and the widespread introduction of artificial intelligence methods and technologies in economic sectors.
4	70711302 – Metrology, standardization and quality management (by industry)	2022	Legal bases of metrology, technical regulation, standardization and certification	It is important to understand the essence of laws and regulatory documents adopted in the field, analysis of documents on metrology, technical regulation, standardization, conformity assessment.

		2020	Certification of aviation equipment	Providing students with theoretical knowledge on the certification of aviation equipment, acquiring skills and knowledge about the basic concepts, procedures and participants of mandatory and voluntary certification of products in the Republic and abroad, the basic concepts, procedures and participants of the certification of civil aviation equipment takes

The students as well as industrial stakeholders confirm their own involvement in the development of the programmes which is directly taken into account by the university for the adaptation of the curricula and contents of individual modules. However, consistent with the impression of the experts, also the industrial stakeholders wish more opportunities for specializations through elective courses. Moreover, they suggest that in the course of the further development of the programmes, topics like data mining and information security should be enhanced.

In summary, the experts confirm that the curricula are periodically reviewed with regard to the implementation of the programme objectives in a process that involves all relevant stakeholders, including the students. The review processes involve a formal curriculum board and are adequately documented.

Criterion 1.4 Admission Requirements

Evidence:

- Self-Assessment Report
- TSTU admission website: https://tdtu.uz/qabul
- Law “On Education” No. ZRUz-637
- Decree of the President of the Republic of Uzbekistan “On the organisation of admission to study in state higher educational institutions” No. UP-60
- “On Adopting the Regulations on the Procedure for Admission to Studies, Transfer, Readmission and Exclusion of Students at Higher Educational Institutions”
- “Regulations on the procedure for admission to institutions of higher education, transfer, reinstatement and exclusion of students”
- "Decision on the Approval of the Rules for Admission to Higher Education Institutions, Transfer, Readmission and Exclusion of Students"
- Discussions during the audit

Preliminary assessment and analysis of the experts:
TSTU´s admission regulations are published on the university's admission website.

The admission is mainly regulated by the state and determined by the Law "On Education" No. ZRUz-637 and Decree of the President of the Republic of Uzbekistan "On the organisation of admission to study in state higher educational institutions" No. UP-60.

Admission to Bachelor´s programmes is additionally regulated by the Decision of the Cabinet of Ministers of the Republic of Uzbekistan No. RP-393 "On Adopting the Regulations on the Procedure for Admission to Studies, Transfer, Readmission and Exclusion of Students at Higher Educational Institutions". As a prerequisite, applicants for undergraduate programmes must have a certificate of graduation from a secondary school or a diploma of graduation from a college (vocational school). Practical or professional experience is not required.

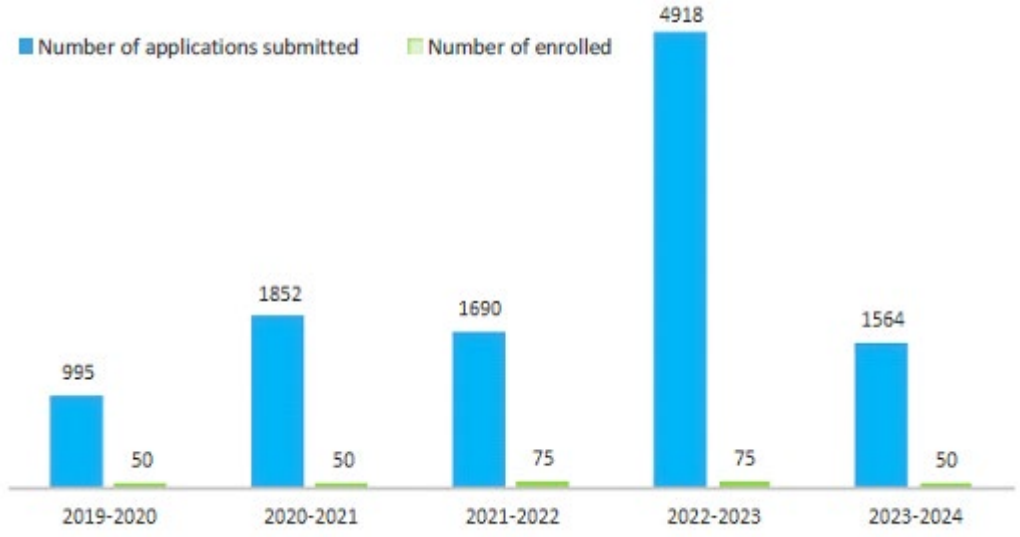
The bases for the admission are the results of a state examination administered by the State Testing Centre. This "National Exam" is a national compulsory and a subject-specific test for each study programme offered in Uzbekistan. The respective examination subjects corresponding to the Bachelor's degree programmes are approved by the Ministry of Higher Education, Science and Innovation and announced at least six months before the start of the examinations. The compulsory exam subjects are "History of Uzbekistan", "Native language", and "Mathematics". The subject-specific components for both BIST and BMSQ are "Physics" and "Mathematics" in a more comprehensive depth. Every applicant can apply and take the tests for up to 5 programmes. Overall, the experts deem this test-based admission system suitable to ensure the necessary prior qualification of the incoming students for the programmes.

Based on the test results, there are different quotas for the admission on a scholarship or a paid basis. Applicants with the highest scores are recommended for state scholarships within a pre-announced allocation of scholarship places. In the next group, applicants are recommended by the State Commission for enrolment on a contractual basis within the allotted places. The university may admit applicants with lower marks than those recommended for state scholarships. These students may study on a paid basis, known as a "super contract". The parameters for the fee and contract basis are published annually on the official website of the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan. Applicants with less than 25% of the maximum possible points cannot be admitted to the programmes. At the same time, a special decree of the President of the Republic of Uzbekistan establishes special quotas for the admission of female students, disabled people and students from low-income families to university education under additional allocations based on a state scholarship which the experts positively acknowledge.

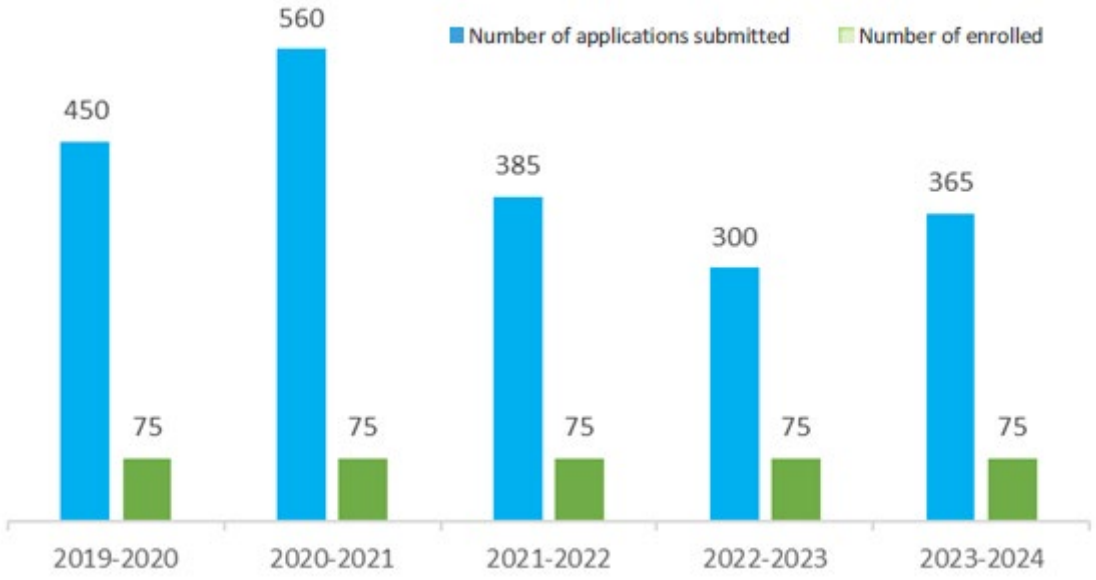
The experts discuss the topic of the state scholarships in multiple interview sessions and learn that this system was adapted recently in a way that the state scholarships of the entrance test results are maintained not for the entire study period anymore but are valid only for one year. In this way, the scholarships are distributed newly every year based on the students` study performance. The students appreciate this merit-based scholarship system but also rate the regular tuition fees as acceptable, as they amount only to approximately one third of the tuition fees to be paid at a comparable private university. The regular tuition fee is UZS 7.5 million (approximately EUR 550) per semester. For foreign students the tuition fees are calculated based on a different system and amount to approximately USD 3,000 per year.

In terms of admission numbers, the representatives of the Rector´s office emphasize that the respective capacities of all study programmes are determined based on the needs of the industry in the relevant sectors. The stakeholders present at the respective meeting confirm their close collaboration for the planning of admission capacities which results in a high share of students finding employment directly after graduation in these companies.

For BIST, TSTU currently offers 75 study places per annual cohort. The following statistics taken from the Self-Assessment Report show the development of the number of applicants and accepted students over the past five years:



For BMS, the number of places is 75 and the numbers of applications are distributed as follows:

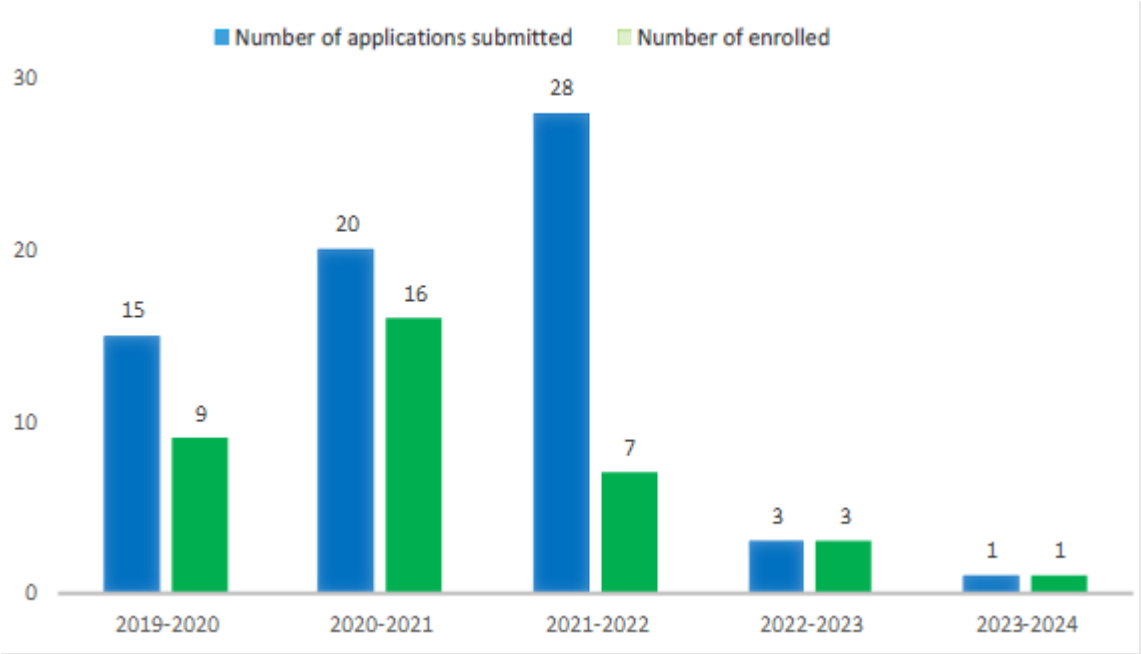


Looking at the statistics, the experts wonder about the strong fluctuation of application numbers in both programmes. In this regard the representatives of the Rector´s office explain that the sector of higher education in Uzbekistan is booming at the moment, meaning that the number of interested and qualified prospective students is increasing a lot, while also the number of universities in the country has been increasing from 70 to about 200 over the past 10 years. Thus, the higher numbers of applicants but also the increasing competition among universities are factors that influence these statistics in recent years. However, due to the quickly changing situation there are no distinguishable trends yet.

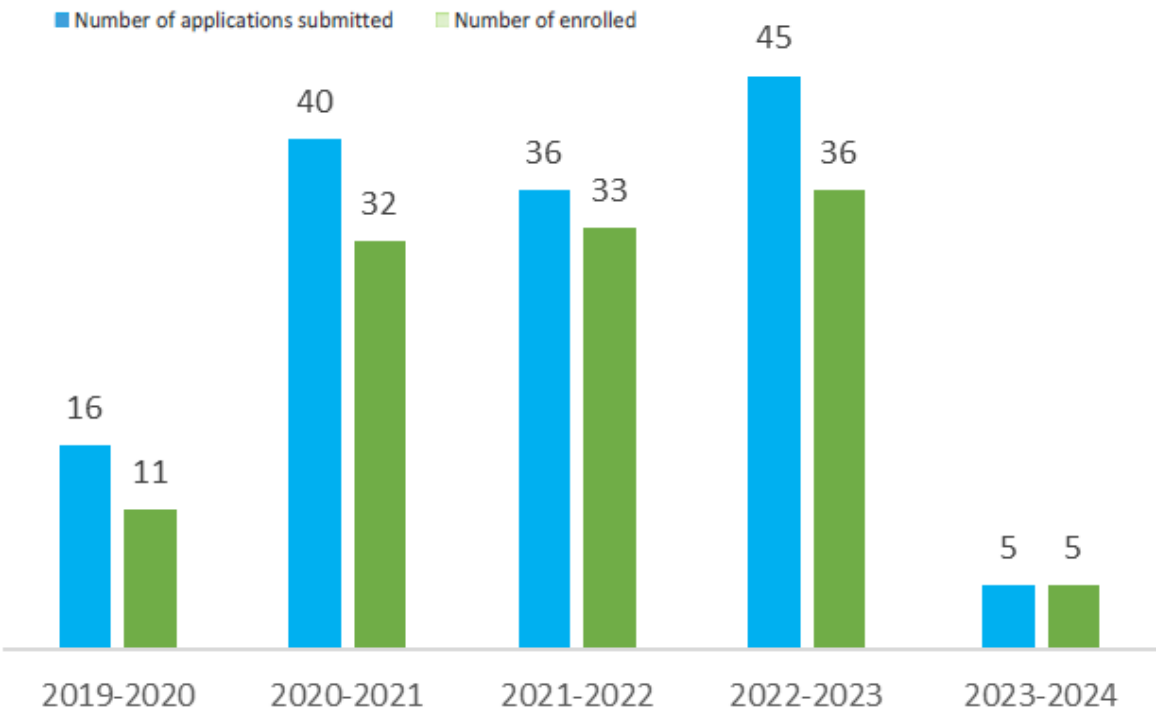
For Master´s programmes, the admission to public higher education institutions takes place once a year in August. Since the academic years 2022/2023, the bases for the student admission are the GPA of the Bachelor´s degree as well as the required minimum score of an English language certificate. In this regard, the experts discuss with the programme coordinators which subjects of Bachelor´s degrees are allowed for the Master´s programmes. It is explained that, for students from Uzbekistan, there is a government-regulated scheme for the eligibility of the Bachelor´s subjects for the Master´s programmes. This scheme determines different sets of required modules for each Master´s programme. For international students, the admission is handled flexibly as long as the basic competences have been acquired according to the module list in the Transcript of Records. The experts are satisfied with this system.

However, the experts wonder about the overall low number of Master´s students as well as the notable decline in numbers in recent years, as outlined in the following figures:

Application and admission numbers for MIES:



Application and admission numbers for MMQS:



The TSTU representatives explain that, because of the strong industry alignment, many students get employed in good jobs directly after their Bachelor graduation. Thus, the incentive for graduates to continue with a Master´s degree, especially for people who seek to work in the industry, is generally low. The recent decline in numbers is additionally

explained with the requirement of the English language certificate as prerequisite for the Master´s programmes, which was introduced by the respective ministry in 2022. This appears to be a considerable obstacle for many students. The university has already recognized this challenge and tried to accommodate this matter with additional support for students to obtain the certificate and by granting two years with two Master´s admission rounds, which explains the inconsistency regarding the intake rhythm in the Self-Assessment Report. By now, the intake rhythm is again annually. Nevertheless, as the numbers remain low the experts recommend to further increase the support for students to obtain the English language in a structured way from the beginning of the undergraduate studies on.

The admission of foreign citizens to educational institutions of the Republic of Uzbekistan is carried out on the basis of international agreements of the Republic of Uzbekistan, collective and individual agreements and arrangements. Admission of foreign citizens is carried out based on the results of an interview and registration in accordance with the procedure established by the Ministry of Higher Education, Science and Innovation and the Ministry of School and Pre-school Education of the Republic of Uzbekistan. The regulations are defined in the documents “On Improving the Procedure of Admission and Education of Foreign Citizens to Educational Institutions of the Republic of Uzbekistan”.

While the experts are generally satisfied with TSTU´s admission regulations, they are missing a clear and transparent policy regarding the recognition of achievements at different education institutions, including also credits obtained during mobility periods. As mentioned in section 1.3, the representatives of the Rector´s office explain that credit recognition is handled flexibly on a case basis to support academic mobility. However, the experts point out that formal rules for the credit recognition based on the principles of the Lisbon Convention need to be transparent and binding to ensure the qualification level. Therefore, they require TSTU to issue a respective policy.

In summary, the experts confirm that the admission requirements and procedures are binding, and transparent. The admission requirements ensure the necessary prior qualification of students for the respective programmes. However, the experts recommend TSTU to further support students to obtain the English language certificate to be able to increase the number of Master´s students. Also, TSTU needs to formalize the regulations for the recognition of externally achieved credits and qualifications.

Criterion 1.5 Workload and Credits

Evidence:

- Self-Assessment Report
- Study plans
- Module descriptions of all study programmes
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan "on measures to improve the system associated with the organisation of the educational process in higher educational institutions"
- "Regulation on the procedure for introducing a credit-module system into the educational process in higher education institutions"
- Questionnaire on the credit module system
- Discussions during the audit

Preliminary assessment and analysis of the experts:

According to the Decree of the Cabinet of Ministers of the Republic of Uzbekistan "on measures to improve the system associated with the organisation of the educational process in higher educational institutions", TSTU has implemented the ECTS credit system which is based on the student workload in terms of both contact hours and independent study time. One credit point is set equivalent to 30 hours of work. In all programmes, the credit load per semester is 30 ECTS. Thus, the Bachelor´s programmes with a duration of 4 years have a credit load of 240 ECTS and the Master´s programmes with a duration of 2 years have a credit load of 120 ECTS. The experts are generally satisfied with the credit system and deem the credit allocation for the individual modules to be sensible.

However, during the on-site visitation, the experts enquire about the verification of the student workload in relation to the credits. In the documentation of the Self-Assessment Report, a survey template was contained, which however does not fulfil the purpose of monitoring the student workload appropriately in the eyes of the experts. Therefore, they discuss this matter with the programme coordinators which explain that, if not defined otherwise in the module descriptions, the regular balance of presence and self-study time is 40:60. Based on this distribution and the number of credits awarded to a module, the respective tasks are allocated for the independent workload. However, no answers are given to the question how it is monitored that these tasks meet the designated number of work hours. This impression is reinforced during the interview session, as the students present do not seem to be well-informed about the credit system itself and the meaning of workload and a respective evaluation. Therefore, the experts require TSTU to transparently evaluate the student workload and allocate the credits accordingly. In this regard, the

experts also point to the missing Bachelor´s thesis module which also needs to be credited. Nevertheless, they are satisfied to get the students´ confirmation that the workload is overall appropriate and distributed evenly over all semesters.

In summary, the experts confirm that a workload-based credit system is implemented which considers both contact hours and self-study time. The total credit numbers meet the ECTS users guide´s minimum requirements for Bachelor´s and Master´s degrees respectively, and the credit load is distributed evenly over the study period. However, the fit of the designated workload of each module and the actual student workload needs to be evaluated transparently to give a foundation for the credit allocation.

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

- Self-Assessment Report
- Study plans
- Module descriptions of all study programmes
- Results of student and teaching staff questionnaires
- Discussions during the audit

Preliminary assessment and analysis of the experts:
As explained in the Self-Assessment Report, the programmes rely both on classroom teaching as well as independent student work. The relation of classroom teaching to independent work is approximately 40:60 in all programmes which the experts deem reasonable.

Classroom teaching is done in form of lectures, practicals, laboratory, and seminars which employ a student-centred learning and teaching approach with ample methodology. While lectures are held in large groups of up to 100 participants, practical lessons take place in groups of maximum 25 students to allow a closer guidance for the practical application and exercise of the theoretical knowledge. For laboratory classes, the maximum group size is 12. The teaching staff explains that that all courses are taught in an application-oriented manner, using various interactive media and methods like brainstorming, group assignments and clustering. Some modules include digital teaching components, but the main share of structured teaching activities is conducted in person. The experts also positively note the regular use of individual presentations by the students to train their speaking skills. During the on-site visit, the experts have also the opportunity to observe students in practical classes and gain a positive impression of the close supervision by the teachers and

the hands-on experience and insights the students can get in these classes. The students confirm their satisfaction with the teaching methodology and supervision.

However, the experts gain the impression that the application-oriented teaching approach misses the basic theoretical foundations in multiple instances. As an example, they mention one experiment in one of the metrology labs in which the students have to measure the amount of grain seeds. The students conduct different measurements with a respective machine and learn how to interpret and apply the outcomes. On the other hand, the experts would deem it useful for students to also learn how the measuring machine itself works and how the calculations would look like when being done by hand in order to be able to critically assess and question the applied methods and results. In this regard, the experts recommend TSTU overall to encourage controversial discussions among the students regarding the teaching content, which the experts deem to be a foundation for successful scientific work.

Nevertheless, the experts note positively that students are actively engaged in the research projects of the teaching staff from the second year of study onwards. This is actively fostered by TSTU as part of their teaching methodology as well as by the Uzbek government which, as the teaching staff explains, allocates funding for research projects specifically under the premises of including students in the work. As the experts also see during the visitation of facilities, this early exposure of the students to practical lab work and research benefits the students in their abilities to independently contribute to projects and conduct their own thesis projects.

According to the Self-Assessment Report, the instruction, in line with the first learning outcome of the Bachelor´s programmes, is delivered both in Uzbek and Russian language. The experts are curious about how this is done in practice and learn that every module is taught twice, in Uzbek and Russian language respectively. When entering the programmes, the students have to choose in which language they want to attend the classes. The programme coordinators affirm that the coordination effort of this practice is quite intense but supported by the Uzbek university system, and that the number of teaching staff is still sufficient to cover the double teaching load. Some of the lecturers are apt to teach both classes while, for most of the modules, there are two designated teachers as outlined in the module handbooks.

As evidenced by the results of questionnaires among the students which, according to the Self-Assessment Report are conducted every semester, the students have the opportunity to assess the applied teaching methodology and give open feedback. Additionally, the university also conducts surveys among the teaching staff to enquire about their self-

assessment of the teaching methods, plans to change and further develop teaching approaches, and the interaction with students in class.

In summary, the experts confirm that a variety of teaching methods and didactic means are used to promote achieving the learning outcomes and support student-centred learning and teaching. Digital teaching is integrated into the compound of teaching methodology to a reasonable extent which supports students in their learning process. The degree programmes contain an adequate balance of contact hours and self-study time. The experts also confirm that the students are introduced into scientific work through their active involvement into the teaching staffs´ projects. Nevertheless, in that regard, the experts recommend TSTU to strengthen the foundations and encourage controversial and critical debates as the essence of scientific progress. Furthermore, it is regularly reviewed whether the utilised learning and teaching methods support the achievement of the programme objectives.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 1:

Criterion 1.1:

TSTU submitted a revised version of the learning outcomes. While the experts note some improvement in terms of the formulation, they point out that the newly submitted PLOs are specified separately for each module and are therefore considered Course Learning Outcomes instead of Programme Learning Outcomes. The experts stress that Programme Learning Outcomes have to describe what a successful student should be able to demonstrate at the end of the programme on a broader integrated level. Therefore, the number of Programme Learning Outcomes should also be limited. Therefore, the experts reformulate their initial requirement with the scope of re-developing the Programme Learning Outcomes according to the definition of this concept.

Criterion 1.2:

TSTU did not comment on this criterion and the expert sustain their requirement to harmonize the programme titles in all official documents and the programmes´ websites.

Criterion 1.3:

TSTU did not comment on this criterion and the experts sustain their requirements to concisely outline all modules with singular IDs and implement a mandatory Bachelor´s thesis.

Criterion 1.4:

TSTU submitted a newly established regulation regarding the recognition of achievements at other higher education institutions during student mobility activities of a duration of at most two semesters. The experts positively acknowledge this newly designed regulation and are satisfied with its provision for student exchanges. However, they point out that the recognition policy needs to enable academic mobility also beyond temporary student exchanges; e.g., if a student wants or needs to switch the university or the programme within the university, the regulations need to capture how already achieved credits that match the requirements of the respective programmes at TSTU care recognised. Therefore, they reformulate their initial requirement to extend the scope of the policy for the recognition of external achievements beyond the temporary exchange of students.

Criterion 1.5:

TSTU did not comment on this criterion and the experts therefore sustain their requirement to transparently evaluate the workload of students and allocate the credits accordingly.

Criterion 1.6:

TSTU did not comment on this criterion. The experts uphold their recommendation to encourage critical and controversial discussions as a methodology of scientific work.

Final assessment

Based on the sparse documentation submitted as statement of the university, the experts find that many critical points still need to be addressed as outlined in the original report and consider this criterion **not fulfilled**.

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, Concept and Organisation

Evidence:

- Self-Assessment Report
- Module descriptions of all study programmes
- Academic schedule
- “Instruction to the organization of the educational process according to the credit-module system”
- “Regulations on the system of control and evaluation of students’ knowledge in higher education institutions”
- “Regulations on the final state certification”

- Ministerial order “On approval of the requirements for the performance of the final qualifying work of bachelors in higher educational institutions”
- Program for performing and defending the graduate thesis
- Program of scientific research work and preparation of Master’s thesis
- TSTU examination websites: https://tdtu.uz/students/exams
- Discussions during the audit

Preliminary assessment and analysis of the experts:
As displayed in the module handbooks, each module is usually concluded with a written, oral, or test-based final exam at the end of each semester to determine the achievement of the learning outcomes. The form of examination depends on the form and nature of the subject. The exam schedule does not allow more than one final exam per day and there should always be 2 days between each final exam. Additionally, as stipulated by the “Regulations on the system of control and evaluation of students’ knowledge in higher education institutions”, there can be up to 2 mid-term exams in various forms depending on the nature and credit load of a module. Modules with a credit load of less than 2 academic hours per week are exempt from midterm exams. Throughout the semester, the students´ performances in practical, seminar, laboratory and independent study classes and their activities in these classes are monitored by the subject teacher which, as the students explain, forms a “current” mark. Only if a student has completed and passed all the mid-term assignments during the semester, he/she will be allowed to take the final examination. As another prerequisite, students must have attended at least 75% of all classes. At TSTU, it is a rule that the final exam is never conducted by the teacher who gave the training, but by another teacher to ensure impartiality and fairness.

Some of the modules are assessed by projects. The projects are formed within the framework of the technological tasks of the companies formed at the department. The evaluation of these course works (projects) is carried out by a three-member commission.

The final exam constitutes the grade of the module. The student performance is assessed using a 5-point system as regulated in the assessment instruction. The system, the grading bases, and its equivalents in other education systems are displayed in the following table taken from the Self-Assessment Report:

University Assessment system	Starting to Copy and Set system Test units of	Evaluation system US Assessment	University Assessment System (%)	Assessment	Students knowledge is evaluated according to the following criteria:

	Euro-pean coun-tries	**System (A-F)**			
"5"	"A"	"A+" "A" "A-"	90 - 100	Excellent	the student makes independent conclusions and decisions, can think creatively, independently observe, can apply the acquired knowledge in practice, understands, knows, can express the essence of science (subject), and when it is considered that he has an idea of the subject - score 5 (excellent)
4	" B " "C"	"B+" " B " " B -"	70 - 89	Good	student independently observes, can apply the acquired knowledge in practice, understands the essence of science (topics), knows, can express, tell, and when it is considered that he has an idea of the subject (subject) - score 4 (good)
"3"	" D " "E"	"C+" "C" "C-" " D +" " D " " D -"	60 - 69	Satisfactory	the student is able to apply the acquired knowledge in practice, understands the essence of science (subject), knows, can express, tell and is considered to have an idea of the subject-grade 3(satisfactory)
"2"	«FX»	«F»	0 - 59	Not satisfactory	when it is established that the student has not mastered the program of the subject, does not understand the essence of the subject (topic), and has no idea about

					the subject-grade 2 (unsatisfactory)

Students have the right to appeal against grades within 24 hours from the publication of the exam results. There is an Appeals Committee which consists of at least five members of the academic staff that were not involved in the original assessment.

TSTU uses the key figure of Grade Point Averages (GPA), defined as the average grade of a student across all modules, to determine his or her eligibility for course-by-course transfers, scholarships, and further studies.

Students who have not received their permission to take the final examination due to prolonged absence or poor performance during the semester, or if they fail an examination, will receive “academic debt”. These students have the right to study these subjects and retake the exam during the holidays or in the next semester, however, at own additional cost. If students decide to repeat a module during the vacation periods, they must submit a request to the Teaching and Methodology Department for additional tuition during the so-called “interim semester”. The department in question will then draw up a timetable for these students during the interim semester and allow them to attend classes on payment of an additional tuition fee. On the other hand, students who miss classes or fail to complete a mid-term assignment for proven “good” reasons (for health reasons, an accident, the death of a close relative, marriage, birth of a child) and correspondingly do not master the subject within the established time limit, given appropriate make-up assignments or are allowed to re-take subjects by the educational and methodological department in agreement with the Vice-rector for academic affairs. The experts are generally satisfied with this system but do not find the provisions and conditions for remedial exams clearly outlined in the examination regulations. Therefore, they require to amend respective specifications of the regulations in this regard.

During the on-site visitation, the experts examine selected examples of exams and confirm their adequacy for assessing the attainment of the programmes´ learning outcomes. The students express their satisfaction with the examination system which, in their opinion, is composed of suitable assessment methods, ensures fair assessment and is organized in a way for students to successfully complete all assignments and tasks. The students confirm that they are aware of the exam regulations in place as well as their options for the review of graded exams, appeal against grades, and remedial examinations. The students also explain that, for the modules which are spread over multiple semesters (compare section

1.3), there is an exam for each semester, nevertheless. Thus, in case of failing an exam of these modules, only the respective part needs to be re-done. Moreover, the students also confirm their satisfaction with the feedback they receive on their exam performances. Both the prerequisites for exam admission as well as the grading system appear reasonable to the experts.

According to the Self-Assessment Report, the final examination component of the Bachelor´s programmes is an undergraduate thesis, which is regulated by the provisions in the ministerial order "On approval of the requirements for the performance of the final qualifying work of bachelors in higher educational institutions". The recommended length is 65 to 70 computer-written pages on topics that are usually related to industry problems. On the other hand, the Master´s programmes require the students to do research and accordingly write an extensive Master´s thesis.

During the on-site visit, the experts examine multiple examples of both Bachelor´s and Master´s theses. Also, they are satisfied to see that there are transparent regulations of the formal and content-related requirements of the thesis. They confirm their adequacy in terms of topics, methodologies, and formalities. Nevertheless, they wonder why the Bachelor´s thesis are not contained in the curricular overview and the module handbooks. Instead, the final component of both programmes is a "State attestation" worth 5 ECTS credits. As the experts learn during the audit, this state attestation is a compulsory component of each study programme mandated by ministerial regulations to, as outlined in the respective regulation, determine "the level of training of the student in order to meet the general requirements for the graduate in the qualification requirements for this field of study". The programme coordinators explain that, depending on their chosen programme or specialization, students can choose between the state attestation in form of a test exam or a written thesis project. As the preparation of a thesis is apparently not compulsory for all students, the experts point out that this needs to be a mandatory part of the curriculum for all students and require TSTU to adapt the curriculum in this regard.

As the experts confirm, the regulations also contain a provision for the continuous review of the examination system by the Department of Educational Quality Control. Furthermore, the questionnaires among students and lecturers give them opportunities to evaluate the examination system.

In summary, the experts confirm that there are module-specific exams which assess the extent to which the defined learning objectives have been achieved. The types of exams are specified for each module and students are informed about the conditions for completing the individual modules. Students have sufficient time for their preparation and structural overloads are avoided. The exams are graded transparently and fairly, and students

have the opportunity to review their examinations respectively consult lecturers in regarding the results. The experts acknowledge the detailed examination regulations but are missing transparent provisions for remedial exams which need to be specified in the regulations. The study programmes include a final thesis each in which the students have to demonstrate that they are able to work independently on a task at the intended level of the degree programme. However, for the Bachelor´s programmes, the final thesis must be formally and mandatorily included in the curriculum. The experts further confirm that it is regularly reviewed whether the exams can adequately determine the achievement of the learning objectives and whether the requirements are appropriate to the level of the degree programme.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 2:

TSTU did not comment on this criterion.

Final assessment:

Based on their original assessment, the experts consider this criterion to be **fulfilled**.

3. Resources

Criterion 3.1 Staff and Development

Evidence:

- Self-Assessment Report
- Staff handbooks of all study programmes
- Cabinet Decree “on approval of the regulations on the procedure for hiring teachers to work in higher educational institutions on a competitive basis”
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the experts:
According to the Self-Assessment Report, the academic staff of TSTU consists of professors, associate/assistant professors, senior lecturers and PhD students. 24 staff members are involved in the teaching activities of the BIST and MIES; 9 of which have a Doctoral degree. For BMSQ and MMSQ, there are 24 teachers as well, 50 % of which a have a Doctoral degree. Comprehensive staff handbooks for all four study programmes provide information

about the lecturers including short CVs, teaching fields, research projects and publications, as well as activities in special bodies or university committees.

Recruitment of new teaching staff is usually organized at the end of each academic year. Applicants must have at least a Master's degree and give a presentation on their subject area. The Faculty Council makes the final decision on the employment of the lecturer.

Besides the full-time academic staff, TSTU also relies on guest lecturers who are senior professionals and specialists in related industrial companies, regulatory authorities and research institutes. Examples of involved industries, as listed in the Self-Assessment Report, are the Research Institute for the Development of Digital Technologies and Artificial Intelligence in Tashkent, the National Institute of Metrology of Uzbekistan and the Uzbek cadastral agency under the State Tax Committee deputy. Multiple industry representatives present during the audit confirm their involvement in the teaching activities of the programmes, mostly in modules which address specific competencies required by the respective industries. Their involvement happens both in form of the delivery of lectures at the university as well as during site visits at their industry plants or experimental/ lab work in the practical facilities of the relevant stakeholders. Besides that, also guest university professors from foreign universities, most recently from Saint Petersburg Polytechnic University and Sorbonne University in Paris, are regularly involved in the teaching activities.

During the audit, the experts also learn that the Master´s students are actively engaged in teaching activities of the respective undergraduate programmes, e.g. as assistants for tutorials. As noted earlier in this report, this involvement is part of their “Scientific pedagogic work”. The academic staff members express their satisfaction with this system and confirm the adequacy of their workload.

Overall, the experts are satisfied with the number and qualifications of the academic staff which facilitates a close supervision of all students and ensures the quality of the degree programmes. The experts also positively note that TSTU seeks to include external experience in its programmes, both from the national industrial practice sector as well as international academic expertise.

TSTU also offers an extensive system for the development of their staff: As first measure, newly recruited junior teachers are assigned to mentors who have been working in the department for many years and participate in their teaching. Furthermore, they receive extra training from their mentors outside of classes. For senior lecturers, there are different programmes for continuous education, too. Every 3 years, professors and teachers undergo professional development courses at the branch professional development centre. During the on-site visit, the experts enquire about the nature of these courses and learn about different kinds of activities. In terms of didactic skills, there is a one-month didactical

training seminar for which, upon successful completion, the lecturers receive a certification with a limited validity. This certificate needs to be renewed every 3 years to ensure that the lecturers are always trained in terms of modern teaching methodology. These training seminars are organized in cooperation between different specialized universities which select the topics and design the courses. For subject-specific further training, there are designated time slots in the lecturer´s academic schedules to visit industrial companies and stakeholders to get insights into recent developments in the field. Moreover, the lecturers are encouraged and supported to take part in lecturer exchange programmes. In recent years, lecturer exchanges in the two concerned departments have been realized with partners in Norway, Finland, Belarus, Russia, Turkey, and China.

Part of the teaching staffs´ duties is also active engagement in research. Representatives of the academic staff report that the distribution of their workload is approximately 50% on teaching and 50% on research and administrative activities, which is positively noted by the experts. The achievements of the staff bodies are summarized in the following tables taken from the Self-Assessment Report:

Department of Processing information and control system:

Indicators/year	**2019**	**2020**	**2021**	**2022**	**2023**
Monographs	2	3	1	3	6
Number/amount of scientific projects, million soums	121	1/227	–	1/138	1/142
Farm Contracts/Amount	–	–	–	–	–
Number of articles in Scopus	–	9	25	17	20
Number of articles in international journals	47	44	40	44	37
Number of articles in local journals	15	18	14	18	49
The number of theses at the Republican Conference	12	51	38	8	33
Number of abstracts at international conferences	69	9	67	51	59
Number of patents	1	5	2	4	4

The number of certificates for the program for exposure	10	20	36	12	24

Department of Metrology, technology, engineering, standards and certification:

Indicators/year	**2019**	**2020**	**2021**	**2022**	**2023**
Monographs	2	3	2	3	3
Number/amount of scientific projects, million sums	1/140	1/165	1/160	1/175	-
Farm contracts/Amount	-	-	-	-	-
Number of articles in Scopus	2	8	7	6	12
Number of articles in international journals	28	30	30	38	36
Number of articles in local journals	20	22	25	26	24
The number of theses at the Republican Conferences	18	20	22	26	30
Number of abstracts at international conferences	14	18	55	60	67
Number of patents	3	2	1	2	1
The number of certificates for the program for exposure	5	7	8	13	15

The academic staff members report that they are well-supported by the university to actively engage in research. In the first place, this concerns the funding of their projects for which the university offers baseline funding and additionally launches different competitions on a regular basis. Also, financial incentives are handed out for successful publications which can top up the lecturers´ salaries by up to 60%. Financial support is also given to cover publication and patenting fees. As part of its strive for research excellence, the university has established its own research journal called “Stars of Technology”. The support for research includes also periods of research leave. Besides that, the staff regularly participates in international research conferences and organizes research conferences at TSTU in cooperation with other Uzbek research and higher education institutions, such as the

international conference on “Prospects of innovative metrological support of industry and its current scientific and practical problems” in May 2023. As noted before, students are actively included in the research activities in practical classes and course work. The experts are satisfied with the extensive support system offered by TSTU.

The qualifications of the teaching staff is regularly monitored by the so-called faculty public council which includes professors and teachers from the faculty, as well as qualified specialists working in production enterprises. This includes an annual paper-based evaluation of the staffs´ teaching, research, methodology, work with youth, and community activities by the university based on the annually set performance goals. Moreover, as mandated by ministerial regulations, professors and teachers undergo an assessment every 5 years. As part of this assessment, the staff needs to deliver open lectures and take tests to assess their subject-specific and didactical skills. Lecturers who fail this test can be dismissed from the university. As the experts consider this a comparatively harsh measure, they further enquire about this assessment. The representatives of the Rector´s office explain that this public assessment is designed to motivate the teaching staff and ensure their continuous improvement and engagement. However, an unfavorable evaluation outcome does not necessarily result in immediate dismissal, but the obligation of additional training or the degradation of the academic rank are considered as milder measures in the first instance. Overall, the share of “failures” in this evaluation is only about 1% which pleases the experts.

In summary, the experts confirm that the composition, professional orientation, and qualifications of the teaching staff are suitable for successfully delivering the degree programmes. Their research and development contribute to the desired level of education. Lecturers have different opportunities to further develop their professional and didactic skills and are supported in using corresponding offers. Moreover, the experts confirm that it is regularly reviewed that the subject-specific and didactic qualifications of the lecturers adequately contribute to the delivery of the degree programme.

Criterion 3.2 Student Support and Student Services

Evidence:

- Self-Assessment Report
- TSTU website: https://www.tdtu.uz/
- Discussions during the audit

Preliminary assessment and analysis of the experts:
As described in previous parts of this report, the students´ support in terms of their academic success is ensured through a close supervision and engagement by the teaching staff. Furthermore, the well-maintained both physical and digital facilities (see section 3.3) support the study progress.

Regarding non-academic support services, TSTU´s website provides information on a broad variety of students associations with various purposes, ranging from academic support clubs over reading, writing and theatre clubs until sports. Moreover, there is "a Student Affairs Council for the purpose of financial incentives for talented, active in social work and students in need of social protection. Based on the provisions of this Council, students who actively participate in spiritual and educational, social work and various activities of the university receive a one-time scholarship in the amount of 3 times the basic scholarship." An alumni network eases the student transition from the university into work life. The students confirm their awareness of and satisfaction with the provided support system.

In summary, the experts confirm that TSTU provides sufficient human resources and organisational structures for individual supervision and support of students, as well as administrative and technical tasks. The allocated advice and guidance on offer assist the students in achieving the learning outcomes and in completing the course within the designated time frame.

Criterion 3.3 Funds and equipment

Evidence:

- Self-Assessment Report
- Examples of cooperation agreements
- TSTU website: https://www.tdtu.uz/
- Library website: https://unilibrary.uz/
- Discussions during the audit

Preliminary assessment and analysis of the experts:
In terms of physical facilities, TSTU has one central campus with teaching and research buildings as well as support facilities. Overall, there are 126 classrooms, 79 lecture rooms, offices and meeting rooms, as well as 47 laboratories of different sizes, some of which the experts visit as part of the on-site visitation.

Besides that, TSTU also collaborates with multiple institutions and companies which offer their lab facilities for student training, internships, thesis projects, and advanced research. Among these are, for the Department of Processing information and control system, the "Uzeltexanoat" association, "Technopark" JSC, "UZTELECOM" JSC, "Uzbekneftgaz" JSC, and the Main Scientific and Methodological Center under the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan. Partners of the Department of Metrology, technology, engineering, standards and certification are the Institute of Standards of Uzbekistan, the National Institute of Metrology of Uzbekistan, and the company Triple Point Engineering LLC.

As a first discussion point regarding the university´s facilities, the experts enquire about the "readiness level" of different facilities as described in the Self-Assessment Report. The experts wonder about this key measure and learn that it measures the availability of room space per student against a normative benchmark. Secondly, the experts ask for clarification why this readiness level is very low for multiple types of facilities, e.g. only 6.25% for "theoretical and general educational laboratory facilities" and 2.3% for computer classrooms. As explanation of these figures the representatives of the Rector´s office explain that, because of the quickly increasing number of high school graduates in Uzbekistan, TSTU was forced by the respective authorities to take on more students for two academic years. In this period, the teaching activities were organized in two shifts to fit university´s capacities, but still negatively affected this key measure. Along these lines, however, the experts figure that the main reason is the unsuitable design of this key measure as it apparently takes all students of the university as calculation basis, independently from their programmes, the course organization, and the respectively varying demands of different programmes for different kinds of facilities. After visiting different teaching and lab facilities in both faculties as well as a newly built central laboratory building which provides also an adequate environment for research work, the experts express their satisfaction with the infrastructure and facilities and have no concerns that the quantity or quality of the disposable infrastructure is short for the delivery of the programmes under review. To avoid this kind of confusion and misunderstanding, they however suggest developing a more reasonable key measure for the adequacy of the facilities in relation to the student capacity.

According to the Self-Assessment Report, TSTU places great emphasis on the acquisition of literature for the courses and laboratory equipment to enhance the quality of education. The budget data shows that an equivalent of about EUR 140,000 has been spend on library equipment between 2019 and 2023. Likewise, the investments into laboratory equipment in this period amounts to more than EUR 2 million. In this regard, the experts discuss TSTU´s main income sources during the on-site visit and learn that 30% of the funds are allocated by the government while approximately 70% are generated through tuition fees. The

representatives of the Rector´s office explain that the available funds provide a sustainable basis for the long-term operation of the programmes. Also, the university representatives clarify that many of the required investments into teaching materials like specialized lab equipment are subsidized or entirely sponsored by industrial stakeholders. Additional funds mainly for research purposes are obtained through joint international projects (e.g. Erasmus funding) and contracted research services for private corporations. The experts deem the equipment adequate for the independent general education of the students in their respective programmes.

The central library is located on the campus, providing access to a broad number of educational resources in Uzbek, Russian and English language. The library actively engages in digitalization and the promotion of the use of information technologies, receiving the status of “Information and Resource Centre” (IRC). The IRC disposes of about 95 thousand bibliographic records and “replenishes the electronic library collection on the portal “kitob.ngmk.uz””. Furthermore, the IRC offers the electronic library platform “uni-library.uz” with full-text monographs, textbooks, manuals, abstracts and scientific articles, including platforms like ResearchGate and Scopus.

TSTU´s digitalization efforts go also beyond the library, providing up-to-date computer hardware and software equipment for teaching purposes as well as individual learning and exercises of the students. There are 29 computer labs, 40 smart classrooms and a multimedia studio. In terms of software, the computers are equipped among others with Microsoft Office programmes, MathCAD, MATLAB, AutoCAD, SolidWorks, Python, Dart, Flutter, Java, MySQL, PostgreSQL, Proteus, VS code, Sublime text, and OpenServer. For the management of digital learning resources, TSTU employs a Moodle-based e-education system. For the university management, including administration, student services, and financial management, there is the HEMIS information system. Via this modular application, among others the curriculum planning and class scheduling are organized. Wi-Fi is accessible all over the campus. During the on-site interview, the students confirm their overall satisfaction with the provided learning facilities which complements the positive impression of the experts.

In terms of support infrastructure, as the students confirm, there are different sports facilities, offices, reading rooms, student rooms, as well as dormitories.

In summary, the experts confirm that the financial resources and the available equipment constitute a sustainable basis for delivering the degree programme. This includes secure funding and reliable financial planning and the provision of sufficient infrastructure and teaching equipment in terms of both quantity and quality in all programmes. Shortages in the availability of specialized industrial equipment are compensated by extensive cooperations with related industries.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 3:

TSTU did not comment on this criterion. The experts renew their recommendation to actively encourage students to take part in mobility activities and to further develop the support system for students in that regard.

Final assessment:

Based on their original assessment, the experts consider this criterion to be **fulfilled**.

4. Transparency and Documentation

Criterion 4.1 Module Descriptions

Evidence:

- Self-Assessment Report
- Module descriptions of all study programmes
- Websites of all study programmes

Preliminary assessment and analysis of the experts:

After studying the module descriptions, the experts confirm that they generally provide the relevant information including course name, course code, the students' total workload, awarded credit points, grading scale, intended learning outcomes, content, recommended literature, possible prerequisites, name of teacher/teachers in charge, exam methods and assessment criteria. However, as noted above in multiple instances, the experts see the urgent necessity to revise and specify the module descriptions. Particular issues to be addressed are the following:

- Each module, i.e. a self-contained curricular unit, needs to be outlined and marked with a unique identifying course code and specific course title. Completeness is essential.
- The learning outcomes and teaching contents must be clearly and specifically defined.
- Content-wise prerequisites for the individual modules should be defined.
- The handbook as well as all official documents should be professionally translated to avoid translation-related mistakes and inconsistencies.

The experts confirm that the module descriptions are transparently published on the programmes´ websites.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Report
- "Samples on approval of the state of higher education on bachelor's and master's degree"
- Sample of Diploma Certificates and Diploma Supplements for both study programmes

Preliminary assessment and analysis of the experts:
The experts confirm that the students of the four study programmes are awarded a Diploma/Certificate and a Diploma Supplement upon completion of their studies. Both documents are also issued in English. The Diploma Supplement is designed according to the template of "Europass" and contains all the necessary information about the degree programme. Instead of a separate Transcript of Records, the Diploma Supplement contains a list of all modules, credits achieved, grades and the cumulative GPA achieved by the student.

Criterion 4.3 Relevant Rules

Evidence:

- Self-Assessment Report
- Charter of TSTU
- Code of ethics of TSTU
- All relevant regulations as published on the university's website
- Websites of all study programmes

Preliminary assessment and analysis of the experts:
According to the Self-Assessment Report, the foundation of all regulations at TSTU is the university´s charter and the code of ethics. The auditors confirm that the rights and duties of both TSTU and the students are clearly defined and binding. All rules and regulations are published on the university's website and the students receive the course material at the beginning of each semester.

In addition, all relevant information about the degree programmes (e.g., module handbook, study plan, intended learning outcomes) is available on the websites of the

programmes. While the experts are satisfied with the level of transparency, they notice that the English version of TSTU apparently captures only the information for the programmes that have undergone international accreditation. In terms of the pursuit of international standing, they suggest to provide the full website and sub-page contents of the university also in English language. Furthermore, they recommend revising the websites in terms of language and structure to ensure that all the relevant information can be easily found and accessed.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 4:

TSTU did not comment on this criterion.

The experts point towards their original assessment and sustain the requirement to intensively revise the module handbooks, particularly with respect to the following aspects:

- Ensuring completeness and coherence of all information for all modules.
- Specifying the learning outcomes and provide clear content descriptions.
- Defining prerequisites.

Furthermore, in terms of transparency and professional presentation of the programmes, it is recommended to professionally translate the module descriptions and review the programmes´ websites.

Final assessment:

The experts still see the need for action with regard to the module handbooks and consider this criterion to be only **partly fulfilled**.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- Regulations “to control the quality of education”
- Samples of surveys for students, teachers and industry partners/ graduates
- Overviews of survey results

- Charter of TSTU
- Discussions during the audit

Preliminary assessment and analysis of the experts:
TSTU´s quality management system includes elements of both internal as well as external quality assurance. According to the regulations “to control the quality of education”, the university´s central actor of internal quality assurance is the Department of quality control of education. This departments´ function is to study the compliance of the education with state standards, monitor the quality of training, organise internal certification of TSTU, identify factors that negatively affect the quality of education, and take measures to eliminate and prevent them. As part of its quality management activities, TSTU employs surveys directed at students, teachers, and industry partners respectively graduates, as mentioned in previous sections of this report.

Students are surveyed twice at the end of each semester. One survey is conducted by the department and assesses students’ overall satisfaction with the quality of their education. The other survey is conducted by the lecturers and assesses the students' satisfaction with the courses and teaching methods. A summary of the survey results shows that about 85 % of the respondents are pleased with the university and 62 % are fully satisfied with the teachers and the learning process (about 30 % partially satisfied). The results of the surveys are discussed and analysed in the meetings of the Scientific and Methodological Rectorate of the Institute, chaired by the Dean of the faculty and the Head of the department. Ultimately, the results of these surveys are used as a basis for decisions regarding the employment of teachers, since, depending on the results, teachers may need to undergo further training. Any shortcomings identified in the courses are also examined and resolved during these meetings. The Department of quality control of education prepares an analytical report on the basis of the data collected and submits the final conclusions to the Rector of the university and the Vice-Rector for Educational Affairs. In accordance with the Rector's instructions, the results of the survey are made available to the Academic Council, but individual names will not be disclosed and the results will be presented in summary form. As the students confirm, the results of the survey are also communicated back to students via online information channels. In addition to formal evaluations, students are encouraged to provide verbal feedback directly to their teachers, which is then discussed in class. Additionally, for the teaching staff, there is an online survey as an instrument for self-reflection regarding the teaching processes and the interaction with students, which is also monitored by the university.

Likewise, TSTU has an extensive network of industrial stakeholders which are included to the development and quality assurance processes for the programmes in different ways.

Besides the programme-specific formal and informal feedback channels described above, as the stakeholders explain during the on-site interview, satisfaction surveys are conducted among industrial partners and employers to assess the perception of the university´s educational success from outside. The stylized survey results show that about 90 % of the respondents rate the knowledge and practical skills of the graduates as good or excellent. Besides that, the marketing department conducts an analysis of the needs of employers for continuing education every year to determine the need for personnel in the existing industry, service and other sectors.

Elements of external quality assurance are the Uzbek national inspections of education quality control, lastly done in 2018. In addition, TSTU is increasingly pursuing the accreditation of its study programmes by international accreditation agencies for the purpose of international recognition, enhancement of quality standards, and increase of reputation. All four programmes under review are subject to international programme accreditation by ASIIN for the first time.

TSTU emphasizes its progress in quality development by its participation in different university rankings, including the QS university ranking, SCImago ranking, and the Times Higher Education Impact ranking.

In summary, the experts confirm that the study programmes are subject to periodical internal as well as external quality assurance in a process that includes all relevant stakeholders. The system includes a large network of external industrial stakeholders as well as the university staff and students. The experts further confirm that the feedback loop is closed as students are informed about the results of their surveys. The experts are satisfied with TSTU´s quality assurance system and encourage the university to continue its path of international benchmarking for enhancing the programmes´ quality.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion 5:

TSTU did not comment on this criterion.

Final assessment:

Based on their original assessment, the experts consider this criterion to be **fulfilled**.

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

- Clarification of the learning outcomes
- Regulations for the recognition of external achievements

E Comment of the Higher Education Institution (28.04.2025)

The institution provided the following additional documents:

- Working document regarding the revision of learning outcomes
- Regulations “Academic mobility of students of higher education institutions on the order of organization”

F Summary: Expert recommendations (22.05.2025)

Taking into account the additional information and the comments given by TSTU the experts summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Information systems and technologies	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ba Metrology and standardization	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ma Intelligent engineering systems	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ma Metrology, standardization and quality management	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030

Requirements

For all programmes

A 1. (ASIIN 1.1) Re-develop the programme learning outcomes according to the definition of this concept. All leaning outcomes need to be formulated in an outcome-based way and harmonized in all official documents.

A 2. (ASIIN 1.2) Harmonize the programme titles in all official documents and the programmes´ websites.

A 3. (ASIIN 1.3/ 4.1) Concisely outline all individual modules/ courses with singular IDs.

A 4. (ASIIN 1.3/ 1.5/ 2) Implement a mandatory Bachelor´s thesis, establish transparent regulations for it, and award credits accordingly.

A 5. (ASIIN 1.4) Extend the scope of the policy for the recognition of external achievements beyond the temporary exchange of students

A 6. (ASIIN 1.5/ 5) Transparently evaluate the workload of students and allocate the credits accordingly.

A 7. (ASIIN 4.1) Revise the module handbook with the scope of:

a) Ensuring completeness and coherence of all information for all modules.

b) Specifying the learning outcomes and provide clear content descriptions.

c) Defining prerequisites.

Recommendations

For all programmes

E 1. (ASIIN 1.3) It is recommended to formulate the module titles and contents more precisely.

E 2. (ASIIN 1.3) It is recommended to offer more opportunities for individual specialization by offering a greater and more flexible choice of electives.

E 3. (ASIIN 1.3) It is recommended to offer the module “Research methodology” already in the undergraduate programmes.

E 4. (ASIIN 1.4) It is recommended to further increase the support for students to obtain the English language certificate in a structured way from the beginning of the undergraduate studies on.

E 5. (ASIIN 1.6) It is recommended to encourage critical and controversial discussions as a methodology of scientific work.

E 6. (ASIIN 3.3) It is recommended to actively encourage students to take part in mobility activities and to further develop the support system for students in that regard.

E 7. (ASIIN 4.1) It is recommended to professionally translate the module descriptions.

E 8. (ASIIN 4.2) It is recommended to review the programmes’ websites in terms of language and structure.

G Comment of the Technical Committees

Technical Committee 01 – Mechanical Engineering/Process Engineering (05.06.2025)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the absence of final theses in detail. It considers the requirement proposed by the reviewers to be appropriate in order to improve the quality of the Bachelor's programme. However, it deems it necessary to also examine whether the newly introduced final theses will meet an adequate quality standard. Therefore, it proposes that, in addition to the introduction of a final thesis as part of fulfilling the condition, the university be requested to submit Bachelor's theses after 2.5 years, the quality of which will then be reviewed by the Technical Committee. The continued accreditation for the full period of five years should be made dependent on the assessed quality of these Bachelor's theses.

Assessment and analysis for the award of the EUR-ACE label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 01 – Mechanical Engineering/Process Engineering.

The Technical Committee 01 – Mechanical Engineering/Process Engineering recommends the award of the seals as follows:

Degree Programme	**ASIIN Seal**	**Accredited by German Engineers**	**Maximum duration of accreditation**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Metrology and standardization	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ma Metrology, standardization and quality management	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030

Technical Committee 02 – Electrical Engineering/Information Technology (05.06.2025)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the procedure and agrees with the assessment of the experts.

Assessment and analysis for the award of the EUR-ACE label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering/Information Technology.

The Technical Committee 02 – Electrical Engineering/Information Technology recommends the award of the seals as follows:

Degree Programme	**ASIIN Seal**	**Accredited by German Engineers**	**Maximum duration of accreditation**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Information systems and technologies	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ba Metrology and standardization	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ma Intelligent engineering systems	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ma Metrology, standardization and quality management	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030

Requirements

For all programmes

A 1. (ASIIN 1.1) Re-develop the programme learning outcomes according to the definition of this concept. All learning outcomes need to be formulated in an outcome-based way and harmonized in all official documents.

A 2. (ASIIN 1.2) Harmonize the programme titles in all official documents and the programmes´ websites.

A 3. (ASIIN 1.3/ 4.1) Concisely outline all individual modules/ courses with singular IDs.

A 4. (ASIIN 1.3/ 1.5/ 2) Implement a mandatory Bachelor´s thesis, establish transparent regulations for it, and award credits accordingly.

A 5. (ASIIN 1.4) Establish a regulation for the recognition of externally achieved competencies.

A 6. (ASIIN 1.5/ 5) Transparently evaluate the workload of students and allocate the credits accordingly.

A 7. (ASIIN 4.1) Revise the module handbook with the scope of:

a) Ensuring completeness and coherence of all information for all modules.

b) Specifying the learning outcomes and provide clear content descriptions.

c) Defining prerequisites.

Recommendations

For all programmes

E 1. (ASIIN 1.3) It is recommended to formulate the module titles and contents more precisely.

E 2. (ASIIN 1.3) It is recommended to offer more opportunities for individual specialization by offering a greater and more flexible choice of electives.

E 3. (ASIIN 1.3) It is recommended to offer the module “Research methodology” already in the undergraduate programmes.

E 4. (ASIIN 1.4) It is recommended to further increase the support for students to obtain the English language certificate in a structured way from the beginning of the undergraduate studies on.

E 5. (ASIIN 1.6) It is recommended to encourage critical and controversial discussions as a methodology of scientific work.

E 6. (ASIIN 3.3) It is recommended to actively encourage students to take part in mobility activities and to further develop the support system for students in that regard.

E 7. (ASIIN 4.1) It is recommended to professionally translate the module descriptions.

E 8. (ASIIN 4.2) It is recommended to review the programmes' websites in terms of language and structure.

Technical Committee 04 – Informatics/Computer Science (11.06.2025)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the procedure and basically agrees with the experts' assessment. However, the TC proposes a rewording of requirement A 5. The TC understands the report to mean that there are currently no official/fixed regulations regarding the recognition of externally acquired competencies. It is therefore not clear to the TC which policy should be "extended". For this reason, the TC is in favour of reformulating the requirement A 5. Otherwise, the TC follows the experts' assessment without any changes.

The Technical Committee 04 – Informatics/Computer Science recommends the award of the seals as follows:

Degree Programme	**ASIIN Seal**	**Accredited by German Engineers**	**Maximum duration of accreditation**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Information systems and technologies	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030
Ma Intelligent engineering systems	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2030

Requirements

For all programmes

A 1. (ASIIN 1.1) Re-develop the programme learning outcomes according to the definition of this concept. All learning outcomes need to be formulated in an outcome-based way and harmonized in all official documents.

A 2. (ASIIN 1.2) Harmonize the programme titles in all official documents and the programmes´ websites.

A 3. (ASIIN 1.3/ 4.1) Concisely outline all individual modules/ courses with singular IDs.

A 4. (ASIIN 1.3/ 1.5/ 2) Implement a mandatory Bachelor´s thesis, establish transparent regulations for it, and award credits accordingly.

A 5. (ASIIN 1.4) Establish a regulation for the recognition of externally achieved competencies.

A 6. (ASIIN 1.5/ 5). Transparently evaluate the workload of students and allocate the credits accordingly.

A 7. (ASIIN 4.1) Revise the module handbook with the scope of:

a) Ensuring completeness and coherence of all information for all modules.

b) Specifying the learning outcomes and provide clear content descriptions.

c) Defining prerequisites.

Recommendations

For all programmes

E 1. (ASIIN 1.3) It is recommended to formulate the module titles and contents more precisely.

E 2. (ASIIN 1.3) It is recommended to offer more opportunities for individual specialization by offering a greater and more flexible choice of electives.

E 3. (ASIIN 1.3) It is recommended to offer the module “Research methodology” already in the undergraduate programmes.

E 4. (ASIIN 1.4) It is recommended to further increase the support for students to obtain the English language certificate in a structured way from the beginning of the undergraduate studies on.

E 5. (ASIIN 1.6) It is recommended to encourage critical and controversial discussions as a methodology of scientific work.

E 6. (ASIIN 3.3) It is recommended to actively encourage students to take part in mobility activities and to further develop the support system for students in that regard.

E 7. (ASIIN 4.1) It is recommended to professionally translate the module descriptions.

E 8. (ASIIN 4.2) It is recommended to review the programmes' websites in terms of language and structure.

H Decision of the Accreditation Commission (27.06.2025)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discusses the procedure and concludes that the proposed requirements are generally well-formulated and can be fulfilled within the one-year period. With respect to A5, the AC follows the proposal of TC 04. Additionally, the AC changes the wording of A6 to appropriately verify the student workload.

Assessment and analysis for the award of the EUR-ACE® Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committees 01 – Mechanical Engineering/Process Engineering and 02 – Electrical Engineering/Information Technology.

The Accreditation Commission decides to award the following seals:

Degree Programme	**ASIIN Seal**	**Accredited by German Engineers**	**Maximum duration of accreditation**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Information systems and technologies	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council
Ba Metrology and standardization	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council
Ma Intelligent engineering systems	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council

Degree Programme	ASIIN Seal	Accredited by German Engineers	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ma Metrology, standardization and quality management	With requirements for one year	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council

Requirements

For all programmes

A 1. (ASIIN 1.1) Re-develop the programme learning outcomes according to the definition of this concept. All learning outcomes need to be formulated in an outcome-based way and harmonized in all official documents.

A 2. (ASIIN 1.2) Harmonize the programme titles in all official documents and the programmes´ websites.

A 3. (ASIIN 1.3/ 4.1) Concisely outline all individual modules/ courses with singular IDs.

A 4. (ASIIN 1.3/ 1.5/ 2) Implement a mandatory Bachelor´s thesis, establish transparent regulations for it, and award credits accordingly.

A 5. (ASIIN 1.4) Establish a regulation for the recognition of externally achieved competencies.

A 6. (ASIIN 1.5/ 5) Verify students' workload and award credit points accordingly.

A 7. (ASIIN 4.1) Revise the module handbook with the scope of:

a) Ensuring completeness and coherence of all information for all modules.

b) Specifying the learning outcomes and provide clear content descriptions.

c) Defining prerequisites.

Recommendations

For all programmes

E 1. (ASIIN 1.3) It is recommended to formulate the module titles and contents more precisely.

E 2. (ASIIN 1.3) It is recommended to offer more opportunities for individual specialization by offering a greater and more flexible choice of electives.

E 3. (ASIIN 1.3) It is recommended to offer the module “Research methodology” already in the undergraduate programmes.

E 4. (ASIIN 1.4) It is recommended to further increase the support for students to obtain the English language certificate in a structured way from the beginning of the undergraduate studies on.

E 5. (ASIIN 1.6) It is recommended to encourage critical and controversial discussions as a methodology of scientific work.

E 6. (ASIIN 3.3) It is recommended to actively encourage students to take part in mobility activities and to further develop the support system for students in that regard.

E 7. (ASIIN 4.1) It is recommended to professionally translate the module descriptions.

E 8. (ASIIN 4.2) It is recommended to review the programmes’ websites in terms of language and structure.

Appendix: Programme Learning Outcomes and Curricula

According to the documentation provided on the programme´s website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the BIST:

LO 1 Able to competently express their speeches in Uzbek, Russian and foreign languages

LO 2 Able to make decisions based on the content of philosophical, historical, religious information, discussions

LO 3 Able to apply basic and exceptional knowledge in the field of mathematical, natural and technical sciences in complex engineering activities using the results of the latest scientific achievements in the field of physics, mechanics and the laws of higher mathematics to solve computational problems and simulate processes in power plants and systems

LO 4 Able to understand, analyze and apply complex phenomena in the field of information technology, computer mathematical software or graphics software using a broad and thorough background in mathematical, natural and engineering sciences

LO 5 Algorithm construction methods, programming principles, software types, software life cycle, programming languages, software tools using programming languages, development skills

LO 6 Able to have the ability to design digital circuits based on logical elements, to simulate them, to use programmable logic devices

LO 7 Able to design an information model of a specific subject area, use modern SUBD to create basic data, present data with the help of various models

LO 8 They will have the ability to standardize and develop metrology, measuring instruments and their metrological features, information systems and technologies, metrological support of information technology systems, determine and check the quality indicators of electrical engineering products

LO 9 Able to develop solutions using the laws of electronics and electrical engineering, intelligent systems for solving energy problems, as well as economic laws and the theory of process control in power plants and systems LO 10 Capable of making decisions based on information about health, safety and work in the workplace, applying the methods of

ensuring the safety of social systems for the preservation, development and effective functioning of the individual and society

LO 11 They will have an understanding of information communication systems, internet technologies, their structure, information management systems and their components, features, application and development trends, digitization of information management

LO 12 Able to know and applies the principles of basic human rights and freedoms in the newly revised Constitution of the Republic of Uzbekistan

LO 13 Able to have knowledge of computer systems and networks, architectures, network technologies, OSI and other model protocols, network technical tools and parameters, information switching methods, IP network addressing, e-mail, types of communication cables, channel multiplexing, coding methods, network design.

LO 14 Able to classifications of information systems, structural schemes, types of design parameters, technological and informational aspects of system automation, their types, will have the ability to calculate and explain them

LO 15 Mathematical tools used in information processing, elements of set theory, elements of graph theory, ordering relation, information system and their types form skills.

LO 16 Able to have the skills to work with image processing algorithms, elements and methods of creating digital images, color creation files

LO 17 The main principles and schemes of the management of technological objects, the main types of information management systems, their mathematical expression, the synthesis of control algorithms and their application to real objects, the ability to determine quality indicators using software packages and methods and apply them to practical issues

LO 18 Basic components of website development, Web applications and HTTP protocol, basic programs for creating web page design, creating flexible static sites on a remote server, designing and creating web applications, and deploying a website to a server will be acquired

LO 19 Fundamental principles of control, mathematical representation of control systems, typical links and their characteristics, expression in vector-matrix form, construction principles of linear, nonlinear and discrete systems, time and frequency characteristics of automatic control systems, their stability, quality indicators, selection of digital control laws, its they will have the skills to determine adjustment parameters and solve synthesis problems LO 20 Ability to describe distributed infrastructures for large data storage and processing, database management systems, Python programming, machine learning, model

specification using Patsy, linear and logistic regression, neural networks, and clustering models

LO 21 Artificial intelligence, discrete sets and logic, theoretical foundations of artificial neural networks, algebraic and logical operations on discrete sets and relationships, types, architecture, training methods and algorithms of artificial neural networks, mathematical means of representing specific information models, algorithms for summarizing and grouping information will have

LO 22 The main components in the field of information security system development, asymmetric encryption methods, hash function, VPN, Electronic digital signature and symmetric data encryption method, formation of tasks related to ensuring cyber security, modern technologies used in the field of cyber security, will have the ability to create cross-network screen schemes

LO 23 Dart mobile programming language, condition, iteration operators, functions and classes, arrays, create software for mobile operating systems using Flutter, create and design a graphical interface (UI), port and support a mobile application

LO 24 To be able to design embedded systems, select a microcontroller for the system being designed, write a program for the microcontroller, implement various data exchange interfaces

LO 25 They will be able to administer networks, server operating systems, manage groups and users in a domain, create and edit group policies, manage password policies, replicate domain controllers, create and manage Windows server roles

LO 26 Able to have the ability to identify and evaluate evolutionary modeling, methods, and monadity of models

The following **curriculum** is presented:

1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester
O'RT11104 – Uzbek (Russian) Language 4 prac. 4 ECTS	DIN11204 – Religious studies 2 lec., 2 sem. 4 ECTS	MBBDT11310 – Database management and programming technologies 1 2 lec., 1 prac 1 lab. 6 ECTS	XT11408 – Foreign language 2 4 prac. 4 ECTS	FAL13504 – Philosophy 2 lec, 2 sem. 4 ECTS	SIM13604 – Field of Economics and Management 2 lec., 2 prac., 4 ECTS	HFX14704 – Safety in Life Activities 2 lec., 1 prac 1 lab. 4 ECTS	
FIZ11210 – Physics 1 2 lec., 1 prac, 1 lab. 4 ECTS	FIZ11210 – Physics 2 2 lec., 1 prac., 1 lab. 6 ECTS	RS12410 – Digital circuits 1 2 lec., 2 lab. 6 ECTS	RS12410 – Digital circuits 2 2 lec., 2 lab. 4 ECTS	EKA13504 – Ecology 2 lec., 1 prac 1 lab. 4 ECTS	MIY13604 – Creating mobile applications 2 lec., 2 prac. Course work 4 ECTS	TRIB14704 – Digital image processing 2 lec., 2 prac. 4 ECTS	
OM11315 – Higher Mathematics 1 2 lec., 2 prac. 5 ECTS	OM11315 – Higher Mathematics 2 3 lec, 3 prac. 6 ECTS	OM11315 – Higher Mathematics 3 2 lec, 2 prac. 4 ECTS	MS12404 – Metrology and Standardization 2 lec., 1 prac., 1 lab. 4 ECTS	BN13610 – Control theory 1 2 lec., 1 prac 1 lab. 4 ECTS	BN13610 – Control theory 2 2 lec., 1 prac 1 lab. Course work 6 ECTS	DRBT14808 – Discrete and digital control systems 1 2 lec., 1 prac 1 lab. 4 ECTS	DRBT14808 – Discrete and digital control systems 2 2 lec., 1 prac 1 lab. 4 ECTS
O'EYT11104 – The latest history of Uzbekistan 2 lec., 2 sem. 4 ECTS	XT11408 – Foreign language 1 4 prac. 4 ECTS	KTT12410 – Computer systems and networks 1 2 lec., 1 prac 1 lab. 6 ECTS	KTT12410 – Computer systems and networks 2 2 lec., 1 prac 1 lab. 4 ECTS	AIBMA12509 – Mathematical bases and algorithms of information processing 2 2 lec., 1 prac 1 lab. 4 ECTS	BD14812 – Big data1 2 lec., 1 prac 1 lab. 4 ECTS	BD14812 – Big data 2 2 lec., 1 prac 1 lab. 4 ECTS	BD14812 – Big data 3 2 lec., 1 prac 1 lab. 4 ECTS
MKG11104 – Engineering and Computer Graphics 2 lec., 2 prac. 4 ECTS	MBBDT11310 – Database management and programming technologies 1 3 lec., 1 prac 1 lab. 4 ECTS	UPP22304 – General pedagogy and psychology/ YTO'RK22304 The new version of the Constitution of the Republic of Uzbekistan 2 lec., 2 sem. 4 ECTS	WT12404 – Web technologies 2 lec., 2 prac. Course work 4 ECTS	WDA23504 – Basics of web programming / FEDA23504 Front-End programming 2 lec., 2 prac. Course work 4 ECTS	MO'T23605 – Microcontrollers and embedded systems 3 lec., 3 prac. 5 ECTS	IEM14808 – Identification and evolutionary modeling 1 2 lec., 1 prac 1 lab. 4 ECTS	IEM14808 – Identification and evolutionary modeling 2 2 lec., 1 prac 1 lab. 4 ECTS

ATD11104 – Algorithmic languages and programming 2 lec., 2 prac. 4 ECTS	MD21206 – Engineering programming/ DA21206 Fundamentals of programming 2 lec., 3 lab. 6 ECTS	SICHT22304 – Technologies of industrial production/ BJAT22304 Information technologies in management processes 2 lec., 2 prac. 4 ECTS	AIBMA12509 – Mathematical bases and algorithms of information processing 1 2 lec., 1 prac 1 lab. 5 ECTS	FM23505 – Civil protection/ TBA23505 – Basics of medical knowledge 2 lec., 2 prac. 5 ECTS		IAT24705 – Intelligent information systems / SIA24705 Fundamentals of artificial intelligence 2 lec., 2 prac. 5 ECTS	ATL14806 – Automated design of information systems 4 lec., 2 prac., Course project 6 ECTS
YK21105 – Introduction to Discipline/ SK21105 – Introduction to Specialty 2 lec., 2 prac. 5 ECTS				TA23505 – Network administration 2 lec., 2 prac. 5 ECTS		AX24810 – Information security 1/ Fundamentals of cybersecurity 1 2 lec., 1 prac 1 lab. 5 ECTS	AX24810 – Information security 2/ Fundamentals of cybersecurity 2 2 lec., 1 prac 1 lab. 5 ECTS
			MA1819 – Qualification practice 5 ECTS		MA1819 – Qualification practice 7 ECTS		MA1819 – Qualification practice 2 ECTS
							BMI4805 – State attestation 5 ECTS
12 lec. + 13 prac. + 1 lab + 2 sem. = 28 h./week	**12 lec. + 9 prac. + 5 lab. + 2 sem.= 28 h./week**	**12 lec. + 6 prac. + 4 lab. + 2 sem. = 24 h./week**	**10 lec. + 9 prac. + 5 lab. = 24h./week**	**14 lec. + 9 prac. + 3 lab. + 2 sem = 28 h./week**	**11 lec. + 9 prac. + 2 lab. = 22 h./week**	**14 lec. + 9 prac. + 5 lab. = 28 h./week**	**12 lec. + 6 prac. + 4 lab. = 22 h./week**
7 exam	**6 exam**	**6 exam**	**6 exam 1 course work 1 practic report**	**7 exam 1 course work**	**5 exam 2 course work 1 practic report**	**7 exam**	**5 exam 1 course project 1 practic report State attestation**
30 ECTS	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**
Total							
Component by selection 5 ECTS (16,67%)	**Component by selection 6 ECTS (20%)**	**Component by selection 8 ECTS (26,7%)**	**Component by selection 0 ECTS (0 %)**	**Component by selection 9 ECTS (30 %)**	**Component by selection 4 ECTS (13.33%)**	**Component by selection 10 ECTS (33.3%)**	**Component by selection 5 ECTS (16.67%)**

According to the documentation provided on the programme´s website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the MIES:

LO 1 Way to participate in scientific seminars, conferences, and symposiums, development of scientific projects; acquire the skills of conducting scientific, applied research, processing the results of experiments and drawing scientifically based conclusions on their basis, prepare and editing scientific articles.

LO 2 A way of using information technologies in practice and effectively using engineering and technical knowledge in conducting scientific practice and processing the results of experiments and drawing scientifically based conclusions on their basis.

LO 3 Laws and principles of teaching special subjects, criteria for choosing educational content, teaching methods and tools, information technologies of teaching, development of teacher's educational normative documents and methodical works; the structure, laws and principles of the teaching process of special subjects, methods and means of attracting students' attention and increasing the effectiveness of training, mastering the skills of organizing and conducting training forms.

LO 4 To master the skills of solving complex problems arising in the intellectualization of engineering systems on the basis of artificial intelligence technologies such as knowledge representation methods and models, expert systems, symbolic computations, neural networks, evolutionary algorithms, formal, conclusions and production models.

LO 5 To acquire the skills of building a thematic model and performing calculations based on the theory of automatic control, identification of control objects, modeling and optimization methods.

LO 6 To acquire the skills to analyze the stability of intelligent control systems, quality indicators, efficiency analysis and synthesis of intelligent adaptive systems based on the analysis of the use of neural networks, construction of models and algorithms for the identification of dynamic objects in adaptive systems

LO 7 Active and passive issues of monitoring, diagnosis and control of technological processes, the structure of the process management and decision-making system, multiple hierarchical algorithms in the intellectualization of technological processes, goal determination, mastering the skills of designing systems.

LO 8 Identification, modeling and optimization of control objects, acquisition of computational skills of algorithms and methods of identification of dynamic objects in engineering

systems and modern methods and algorithms of optimal and adaptive control of technological processes using a solid foundation in the field of intelligent control theory.

LO 9 The main stages of the decision-making process, the correct formulation of general and classical problems of individual and group decision-making and the methods of solving scalar optimization problems, the principles of pareto-optimal decision-making, the axioms of group decision-making and voting paradoxes, the decision support system, know and master the skills of consistency analysis based on multi-criteria decision-making methods and eigenvalues of pairwise comparison matrices.

LO 10 The problem of intellectualization of solving engineering, production processes and management problems, the process of knowledge formation and its use, know the concept of introducing intelligent modeling systems for rapid decision-making, and knowledge and vital thinking technologies for rapid decision-making systems, production management intellectualization of systems, control in weakly structured situations, analysis of intelligent control technologies based on associative memory and acquisition of computing skills.

LO 11 The stages of parallel programming, the principles of developing parallel algorithms, the use of graphics processors, the technologies and systems of developing parallel programs, they know the specific features of the methods of developing complex programs in intelligent engineering systems based on the solution of typical problems of computational mathematics, and acquire the skills to use them.

The following **curriculum** is presented:

1 semester	2 semester	3 semester	4 semester
Scientific activity 50%			
ITIMDT1434 – Scientific research work and preparation of master's thesis 4 ECTS	ITIMDT1434 – Scientific research work and preparation of master's thesis 4 ECTS	ITIMDT1434 – Scientific research work and preparation of master's thesis 10 ECTS	ITIMDT1434 – Scientific research work and preparation of master's thesis 16 ECTS
IPI1312 – Scientifical pedagogic work 4 ECTS	IPI1312 – Scientifical pedagogic work 4 ECTS	IPI1312 – Scientifical pedagogic work 4 ECTS	
			IA2410 – Scientific Practice (Experience Enhancement) 10 ECTS
			DA2404 – State attestation 4 ECTS
Compulsory subjects 38%			
ITM1104 – Scientific Research Methodology 2 lec., 2 prac. 4 ECTS SIUT1106 – Artificial intelligence methods and technologies 2 lec., 2 prac. 6 ECTS	IAT2310 – Intelligent adaptive systems 2 lec., 1 prac., 1 lab. 4 ECTS TJIL2312 – Intelligent control of technological process design 2 lec., 2 prac. 6 ECTS	IAT2310 – Intelligent adaptive systems 2 lec., 1 prac., 1 lab. 6 ECTS TJIL2312 – Intelligent control of technological process design 2 lec., 2 prac. 6 ECTS	
MTIM1210 – Engineering systems imitation modeling 2 lec., 2 prac. 4 ECTS	MTIM1210 – Engineering systems imitation modeling 2 lec., 2 prac. 1 course work 6 ECTS	MFO'M2304 – Methods of teaching special disciplines 2 lec., 2 prac. 4 ECTS	
Component by selection 12%			
MTIB1108 – Identification and management of engineering systems/ **QQQT1108 –** Decision support systems 3 lec, 3 prac. 8 ECTS	**MTBI1206 –** Intellectualization of management of engineering systems/ **PD1206 –** Parallel programming 3 lec, 3 prac. 6 ECTS		
9 lec. + 9 prac. = 18 h./week	**9 lec. + 8 prac. + 1 lab. = 18 h./week**	**6 lec. + 5 prac. + 1 lab. = 12 h./week**	**0 lec. + 0 prac. + 0 lab. = 0 h./week**
4 exam	**4 exam** **1 course work**	**3 exam**	**1 practic report**
30 ECTS	**30 ECTS**	**30 ECTS**	**30 ECTS**
Total			

1 semester	2 semester	3 semester	4 semester
Component by selection 8 ECTS (26.7 %)	**Component by selection 6 ECTS (20%)**	**Component by selection 0 ECTS (0%)**	**Component by selection 0 ECTS (0%)**

According to the documentation provided on the programme´s website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the BMS:

LO 1 Able to competently express his speeches in Uzbek, Russian and foreign languages;

LO 2 Able to make decisions based on information of philosophical and historical content, methods of discussion and polemics, engineering psychology and pedagogy;

LO 3 Able to apply basic and exceptional knowledge in the field of mathematical, natural and technical sciences in complex engineering activities using the results of the latest scientific achievements in the field of physics, mechanics and the laws of higher mathematics to solve computational problems and simulate processes in power plants and systems;

LO 4 Able to understand, analyze and apply complex phenomena in the field of information technology, computer mathematical software or graphics software using a broad and thorough background in mathematical, natural and engineering sciences.

LO 5 Able to understand basic concepts of the field, fundamental principles of control, mathematical expression of automatic control systems, elementary links and their characteristics, representation of multi-dimensional elements in vector-matrix form, stability of linear and nonlinear automatic control systems, quality indicators and synthesis, discrete they know how to analyze and synthesize automatic control systems.

LO 6 Able to develop solutions using economic laws and management theory in the field of intelligent systems, as well as metrology and standardization, to solve the economic problems of the enterprises of production industries.

LO 7 Capable of making decisions based on information about health, safety and work in the workplace, applying the methods of ensuring the safety of social systems for the preservation, development and effective functioning of the individual and society;

LO 8 Fundamental physical constants and their use in the selection of physical quantities, fundamental physical laws used in measurement techniques, and the prospects for the development of measurement systems;

LO 9 Having knowledge and skills in electrical measurement methods and instruments, measurements in thermal engineering, physico-chemical measurements, linear-angular and acoustic measurements, as well as carrying out measurements in the laboratory and processing the results, can use measuring tools in production enterprises;

LO 10 Able to know metrology, measuring instruments, measurement methods, measurement errors, standards, comparison, calibration, ensures the unity of measurements,

organizes measurement processes. Determines the metrological characteristics of measuring instruments and can apply them in production.

LO 11 Able to apply basic and exceptional knowledge Standardization activities, standards and their types, development of standards, technical regulations, technical regulation system, the importance of technical regulations in standardization of products, processes and services and can carry out work to ensure their safety; LO 12 About the types and activities of conformity assessment, activities of international, regional and national organizations and technical barriers to trade and export and import processes of products, participation in quality control of production, products and services, can carry out conformity assessment works;

LO 13 Able to know information about standardization and certification, product quality control, quality and quality control methods, statistical methods of quality control, statistical control methods, can use control cards. LO 14 Able to knows how to use the equipment and devices used to ensure product quality and competitiveness and determine product quality, test, evaluate and determine product quality indicators in the production of exportable products in accordance with specific conditions;

LO 15 Able to knows and follows the principles of basic human rights and freedoms in the newly revised Constitution of the Republic of Uzbekistan;

LO 16 Able to analysis of metrological characteristics of measuring instruments, their effective use in concrete conditions, assessment of measurement accuracy, practical application of measurement uncertainty, processing of measurement results, measurement uncertainty will have the ability to apply knowledge in practice;

LO 17 Able to analyze general information on metrology, standardization, conformity assessment, measurements, measurement methods and types. Uses measurement methods and tools, can analyze measurement errors;

LO 18 Able to knows construction rules of measuring instruments, construction process, general and special construction requirements, design stages, construction documentation, factors affecting tool performance, search for construction solutions, can identify patent-worthy designs;

LO 19 Able to knows measuring devices and device elements, their error detection, characteristics of device elements, reliability, measurement schemes, recording elements can be analyzed and used;

LO 20 Able to analysis of laws and regulations related to metrology, standardization, technical regulation, conformity assessment activities and their role in the implementation of these activities, and can analyze legal documents;

LO 21 Can present the normative basis of comparison and calibration of measuring instruments, the procedure and types of comparison, the basis and methods of calibration, the transfer of the unit of magnitude from standards to working measuring instruments, schemes for comparing the errors and inaccuracies of standards, the results of comparison and calibration;

LO 22 Can carry out work on regulatory control of technical documents, determination of descriptions of control- measuring tools and metrological assurance of production, metrological examination of regulatory documents on the development of modern measurement methods;

LO 23 Able to knows types of information technologies, the efficiency achieved as a result of the use of information technologies, the use of information technologies in quality management, the introduction of modern information technologies in the management of management systems, the use of information technology devices and software tools in management systems;

LO 24 To have knowledge about the importance of intelligent measuring instruments, to analyze the metrological characteristics of intellectual measuring instruments, to use them effectively in concrete conditions, to be able to evaluate the accuracy of measurement based on the calculation of errors;

LO 25 Able to strengthen and expand the acquired theoretical and basic knowledge in the subjects of Metrology, standardlashtirish va certificatelashtirish when conducting qualifying practice.

LO 26 Able to analyze and make decisions on engineering problems based on basic knowledge acquired during training in subjects in the field of Metrology, standardization and conformity assessment.

The following **curriculum** is presented:

1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester
O‘RT11104 Uzbek (Russian) Language 4 prac. 4 ECTS	DIN11204 Religious studies 2 lec., 2 sem. 4 ECTS	OM11315 Higher Mathematics 3 2 lec., 2 prac. 4 ECTS	XT11408 Foreign language 2 4 prac. 4 ECTS	EKO13504 Ecology 2 lec., 1 prac., 1 lab. 4 ECTS	FAL13604 Philosophy 2 lec., 2 sem. 4 ECTS	XFX14704 Life activity safety 2 lec., 1 prac., 1 lab. 4 ECTS	SIM14804 Field of Economics and Management 2 lec., 2 prac. 4 ECTS
FIZ11210 Physics 1 2 lec., 1 prac., 1 lab. 4 ECTS	KIM11204 Chemistry 2 lec., 1 prac., 1 lab. 4 ECTS	O’UV 12602 Measurement methods and tools 2 lec., 1 prac., 1 lab. 6 ECTS	ABA12404 Basics of automatic control 2 lec., 1 prac., 1 lab. 4 ECTS	O’UV 12602 Measurement methods and tools 2 lec., 1 prac., 1 lab. 6 ECTS	O’UV 12602 Measurement methods and tools 2 lec., 1 prac., 1 lab., 1 course work 4 ECTS	MSSB14809 Statistical methods of product quality and quality control 2 lec., 2 prac., 5 ECTS	MSSB14809 Statistical methods of product quality and quality control 2 lec., 2 prac., 4 ECTS
OM11315 Higher Mathematics 1 2 lec., 2 prac. 5 ECTS	XT12408 Foreign language 1 4 prac. 4 ECTS	MA12514 Basics of metrology 2 lec., 2 prac., 4 ECTS	O’UV 12602 Measurement methods and tools 2 lec., 1 prac., 1 lab. 4 ECTS	MA12514 Basics of metrology 2 lec., 2 prac., 1 course work 6 ECTS	O’AK23605 Construction of measuring instruments / O’AM23605 Modeling of measuring instruments 2 lec., 1 prac., 1 lab. 5 ECTS	MSN14811 Product quality control 2 lec., 2 prac. 6 ECTS	MSN14811 Product quality control 2 lec., 2 prac., 1 course work 5 ECTS
O‘EYT11104 Contemporary History of Uzbekistan 2 lec., 2 sem. 4 ECTS	FIZ11210 Physics 2 2 lec., 1 prac., 1 lab. 6 ECTS	SA12410 Basics of standardization 2 lec., 2 prac., 6 ECTS	MA12514 Basics of metrology 2 lec., 2 prac., 4 ECTS	MBA13510 The basis of conformity assessment 3 lec., 2 prac., 1 course work 5 ECTS	MTAT23605 Information technology in management systems 2 lec., 2 prac. 5 ECTS	ICHMT14705 Metrological support of production 2 lec., 2 prac. 5 ECTS	SMT14805 Quality management system 2 lec., 2 prac., 5 ECTS
TTAT11104 Information Technology in Technical Systems 2 lec., 1 prac., 1 lab. 4 ECTS	OM11315 Higher Mathematics 2 3 lec., 3 prac. 6 ECTS	O’QE22305 Elements of measuring devices / O’O’A22305 Measuring transducers and instruments 2 lec., 1 prac., 1 lab. 5 ECTS	SA12410 Basics of standardizatio n 2 lec., 2 prac., 4 ECTS	MuxP23504 Engineering psychology / YTO‘RK23504 The new version of the Constitution of the Republic of Uzbekistan 1,5 lec., 1,5 sem. 4 ECTS	IO’A23605 Intellectual measuring instruments 2 lec., 2 prac. 5 ECTS	FTO’N24705 Measurement uncertainty in science and technology / O’NQINA24705 Theoretical bases of processing measurement results 2 lec., 2 prac. 5 ECTS	TXMNME24805 Regulatory control and metrological examination of technical documents / MTXN24805 Control of regulatory and technical documents 2 lec., 2 prac., 5 ECTS

MKG11104 Engineering and computer graphics 2 lec., 2 prac. 4 ECTS	O'FA11206 Physical basics of measurements 3 lec., 3 prac. 6 ECTS	MSSHA22305 Legal basis of metrology standardization and certification / TJTSTQT22305 Technically legal analysis of the regulatory system 2 lec., 2 prac. 5 ECTS	MBA13510 The basis of conformity assessment 2 lec., 2 prac., 5 ECTS	FM23505 Civil defense / TBA23505 Basics of medical knowledge 2 lec., 2 prac. 5 ECTS		O'VQK24705 Comparison and calibration of measuring instruments / O'VMTU24705 Methods of metrological inspection of measuring instruments 2 lec., 2 prac. 5 ECTS	
YK21105 Introduction to the specialty / MS21105 Metrology and standardizatio n 2 lec., 2 prac. 5 ECTS			MA2814 Qualification practice 5 ECTS		MA2814 Qualification practice 7 ECTS		MA2814 Qualification practice 2 ECTS
							DA4805 State attestation 5 ECTS
12 lec. + 12 prac. + 2 lab. + 2 sem. = 28 h./week	**12 lec. + 12 prac. + 2 lab. + 2 sem. = 28 h./week**	**12 lec. + 10 prac. + 2 lab. = 24 h./week**	**10 lec. + 12 prac. + 2 lab. = 24 h./week**	**12,5 lec. + 8 prac. + 2 lab. + 1,5 sem = 24 h./week**	**10 lec. + 6 prac. + 2 lab. + 2 sem. = 20 h./week**	**12 lec. + 11 prac. + 1 lab. = 24 h./week**	**10 lec. + 10 prac. = 20 h./week**
7 exams	**6 exams**	**6 exams**	**6 exams, 1 practic report**	**6 exams, 2 course work**	**5 exams, 1 course work, 1 practic report**	**6 exams,**	**5 exams, 1 course work, 1 practic report, State attestation**
30 ECTS	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**	**30 ECTS**
Total							
Component by selection 5 ECTS (16,6%)	**Component by selection 0 ECTS (0%)**	**Component by selection 10 ECTS (33,3%)**	**Component by selection 0 ECTS (0%)**	**Component by selection 9 ECTS (30 %), Component**	**Component by selection 15 ECTS (50%),**	**Component by selection 10 ECTS (33.3%)**	**Component by selection 5 ECTS (16,6%)**

According to the documentation provided on the programme´s website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the MMSQ:

LO 1. Capable of participating in scientific seminars, conferences, and symposiums, developing research projects; acquiring skills in conducting scientific and applied research, processing experimental results, and making scientifically justified conclusions based on them, as well as preparing and editing scientific articles

LO 2. Laws and principles of teaching special subjects, criteria for choosing educational content, teaching methods and tools, information technologies of teaching, development of teacher's educational normative documents and methodical works; the structure, laws and principles of the teaching process of special subjects, methods and means of attracting students' attention and increasing the effectiveness of training, mastering the skills of organizing and conducting training forms.

LO 3. Able to participate in scientific seminars, conferences and symposiums, development of scientific projects; to acquire the skills of conducting scientific, applied research, processing the results of experiments and drawing scientifically based conclusions on their basis, preparing and editing scientific articles;

LO 4 Able to know Qualimetry, quality management, classification of tasks and methods, quality system and product quality management, control of quality requirements, qualitative analysis algorithm, qualitative scales can make decisions;

LO 5 Able to use technology of working with automated measuring tools, intellectuall measuring tools, sensors, instruments and main components, software of intelligent measuring systems, analysis of structural parts, converters of intelligent measuring tools, intelligent measuring knows and can use systems software, automated and intellectuall measurement tools;

LO 6. Have an idea and knowledge about product quality and quality system, quality requirements and descriptions, the scientific basis of implementing the technical regulation system in practice, able to analyze the requirements of general and special technical regulations, standards development stages.

LO 7. Can apply experiment planning, principles of experiment plan, theoretical basis of scientific research methods and analysis and the importance of mathematical modeling basis, processing of scientific results and writing reports, correlations, experimental data processing methods, prediction, theoretical generalization.

LO 8. Able to explain key concepts related to metrology, technical regulation, standardization and conformity assessment activities. Able to develop and maintain national standards and technical regulations on the basis of the main legal laws and documents relevant to the activity.

LO 9 Able to know patent system in scientific and technical development, patent-legal aspects of international scientific-technical cooperation and the basics of patent-licensing laws in force in Uzbekistan and other countries, working with patent documents, conducting information searches and methods, licensing bases, assessment of compliance can use normative and scientific-technical documents related to;

LO 10. Can measure quantities, classify measuring instruments according to their accuracy, store size standards, use standards and obtain results, centralized and decentralized sizes and requirements for their creation, storage, and storage facilities, international comparison of standards.

LO 11. Able to know transfer of units of magnitude, standards of units of magnitude, types of standards, creation of standards, storage and transfer of units, measurement of quantities, classification of measuring instruments according to their accuracy, storage of standards of quantities, use of standards and obtaining of results, storage of standards, application to storage buildings can make decisions on the requirements;

LO 12. To have knowledge about the basic concepts, procedures and participants of the certification of civil aviation equipment, to fill out working documents during the certification process, to be able to apply the aviation rules that regulate the certification procedure and airworthiness standards of different categories of aviation equipment;

LO 12. To have knowledge about the basic concepts, procedures and participants of the certification of industrial products, to fill out the working documents during the certification process, to apply the certification procedure and the rules regulating the standards of various categories of industrial equipment.

LO 13. Able to know how to use modern information technologies in practice and how to effectively use engineering and technical knowledge in conducting scientific practice and processing the results of experiments and making scientifically based conclusions based on them.

The following **curriculum** is presented:

1 semester	2 semester	3 semester	4 semester
Scientific activity 50%			
ITIMDT1434 Preparation and protection of research work and master's thesis 4 ECTS	**ITIMDT1434** Preparation and protection of research work and master's thesis 4 ECTS	**ITIMDT1434** Preparation and protection of research work and master's thesis 10 ECTS	**ITIMDT1434** Preparation and protection of research work and master's thesis 16 ECTS
IPI1312 Scientific and pedagogical work 4 ECTS	**IPI1312** Scientific and pedagogical work 4 ECTS	**IPI1312** Scientific and pedagogical work 4 ECTS	**IA2410** Scientific practice (internship) 10 ECTS
			DA2404 State attestation 4 ECTS
Compulsory subjects 38%			
ITM1104 The methodology of scientific research 2 lec., 2 prac. 4 ECTS	**KSBNA1206** Theoretical foundations of qualimetry and Quality Management 2 lec., 2 prac., 1 course work 6 ECTS	**MFO'M2304** Methodology of teaching special subjects 4 prac. 4 ECTS	
MTJTSSSQA1106 Legal bases of metrology, technical regulation, standardization and certification 2 lec., 2 prac. 6 ECTS	**AIO'VNA1206** Theoretical foundations of automated and intellectual measuring instruments 2 lec., 2 prac. 6 ECTS	**STJTSBO2306** The role of standardization and technical regulation systems in quality management 2 lec., 2 prac. 6 ECTS	
PLS1104 Patenting, licensing and certification 2 lec., 2 prac. 4 ECTS	**ERITA1310** Organization and planning of the experiment 2 lec., 2 prac. 4 ECTS	**ERITA1310** Organization and planning of the experiment 2 lec., 2 prac. 6 ECTS	
Component by selection 12%			
KEBO'UIA1108 Measurement standards and scientific basis for the transfer of the size of units / **EHQUTIA1108** Scientific basis of systems of generation and transmission of standards 3 lec., 3 prac., 8 ECTS	**AKTSO'AS1206** Certification of aviation equipment / **SMS1206** Certification of industrial products 3 lec., 3 prac. 6 ECTS		
9 lec. + 9 prac. = 18 h./week	**9 lec. + 9 prac. = 18 h./week,**	**4 lec. + 8 prac. = 12 h./week**	
4 exams 1 course work	**4 exams** 1 course work	**3 exams**	**1 practic report, State attestation**
30 ECTS	**30 ECTS**	**30 ECTS**	**30 ECTS**