NATIONAL CENTER FOR EDUCATIONAL QUALITY ENHANCEMENT

Accreditation Expert Group Report on Higher Education Programme

Master Programme in Information Technology in Nuclear Engineering Georgian Technical University

Date of Evaluation: 31 July 2023

Report Submission Date: 23 September 2023

Tbilisi
2023

Contents

Information about a Higher Education Institution

Name of Institution Indicating its Organizational Legal Form	LEPL Georgian Technical University
Identification Code of Institution	211349192
Type of the Institution	University

Expert Panel Members

Chair (Name, Surname, HEI/Organisation, Country)	Donald Sannella, University of Edinburgh
Member (Name, Surname, HEI/Organisation, Country)	Liana Zagashvili, Sulkhan-Saba Orbeliani University
Member (Name, Surname, HEI/Organisation, Country)	Mikheil Rukhaia, I. Javakhishvili Tbilisi State University
Member (Name, Surname, HEI/Organisation, Country)	Avtandil Tavkhelidze, Ilia State University
Member (Name, Surname, HEI/Organisation, Country)	Ilia Botsvadze, International Black Sea University

I. Information on the education programme

Name of Higher Education Programme (in Georgian)	ინფორმაციული ტექნოლოგიები ბირთვულ ინჟინერიაში
Name of Higher Education Programme (in English)	Information Technology in Nuclear Engineering
Level of Higher Education	VII
Qualification to be Awarded	Master of Science in Informatics
Name and Code of the Detailed Field	Software and application development and analysis, 0613
Indication of the right to provide the teaching of subject/subjects/group of subjects of the relevant cycle of the general education[1]	
Language of Instruction	English
Number of ECTS credits	120
Programme Status (Accredited/ Non-accredited/ Conditionally accredited/new/International accreditation) Indicating Relevant Decision (number, date)	New
Additional requirements for the programme admission (in the case of an art-creative and/or sports educational programme, passing a creative tour/internal competition, or in the case of another programme, specific requirements for admission to the programme/implementation of the programme)	

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[1] In case of Integrated Bachelor's-Master's Teacher Training Educational Programme and Teacher Training Educational Programme

II. Accreditation Report Executive Summary

- **General Information on Education Programme**

The proposed master's degree education programme "Information Technologies in Nuclear Engineering" is for a Master of Science in Informatics, with English as the language of instruction, and a focus on areas of Information Technology that are relevant to designing, modelling and analyzing nuclear experiments. It is closely related to a master's programme with the same name that was conditionally accredited for a period of two years until September 18, 2022.

The programme covers methods of modeling, visualization and organizing large databases, methods for designing, creating and operating nuclear test equipment, making connections between engineering software packages and nuclear engineering tasks, geometric modeling and analysis of experimental equipment, data acquisition and processing in a complex system, experiment simulation and process reconstruction, solving data transfer and distributed computing tasks, adapting software packages to user tasks, and creating nuclear engineering client-server applications. The programme duration is 2 years (4 semesters) and requires completion of 120 ECTS credits.

An important feature of the proposed programme is the opportunities that students in the programme will have to do internships at the European Organization for Nuclear Research (CERN), under agreements signed between the Technical University of Georgia and CERN, with involvement of the Nuclear Engineering Center in the ATLAS projects.

- **Overview of the Accreditation Site Visit**

Before the accreditation site visit, all members of the Expert Panel were supplied with a 38-page self-assessment report together with a detailed specification of the proposed programme, detailed syllabi of the courses on the programme, information on GTU's internal Quality Assurance mechanisms, CVs of programme staff, GTU's rules on planning and development of new educational programmes, a summary of learning methods and activities, and other related documentation.

Four members of the Expert Panel visited the Faculty of Informatics and Control Systems at Georgian Technical University on 31 July 2023 and were given a tour of the programme's facilities. The fifth member and chair, Donald Sannella, then joined the Expert Panel via Zoom and was given an oral report on the facilities by the other panel members. The Expert Panel then interviewed members of the university administration, the team responsible for the self-evaluation report including the head of the programme, members of academic and invited staff, students, alumni, employers, and heads of university and faculty quality assurance. Since the programme is new, students and alumni were from related programmes of the Faculty of Informatics and Control Systems.

The Expert Panel expresses its sincere thanks for the cooperation of all participants and their participation in discussions during the site visit.

- **Brief Overview of Education Programme Compliance with the Standards**

The programme complies with all standard components apart from the following:

- Substantially complies: standard components 1.3, 1.5, 2.1, 4.2, 4.4, 5.2
- Partially complies: standard components 1.2, 1.4, 4.1

- **Recommendations**

    1. Provide compliance document of the programme with the national ICT characteristics document.
    2. Consider changing the programme awarded qualification to one that is a better match to the programme content.
    3. Modify the first learning outcome to be achievable by the programme content.
    4. The curriculum map needs to be reviewed to ensure measurability of programme learning outcomes by the research component or include other study courses, developing learning outcomes at mastering level to ensure complete coverage of the programme's outcomes by the corresponding components achieving all of the programme's outcomes.
    5. Change the programme name to something more appropriate.
    6. Remove the prerequisite from the course "Analytical Thinking and Argumentative Discussion".
    7. Review compulsory literature in syllabi and make sure that they cover all course topics.
    8. The requirement that the bachelor's degree be in a STEM subject should be made explicit in the admission prerequisites.
    9. The English language ability of the academic personnel should be improved or English-speaking academic personnel should be added.
    10. Additional staff should be involved in supervising master's theses on the programme. The six academic staff on the programme are not enough to work with the 20 students planned for the first year.
    11. All literature given as mandatory in course syllabuses should be accessible in the library in electronic or printed form.
    12. Considering that the programme is new and at the same time represents a novelty for the higher education field of Georgia, it is recommended that the external evaluation of the educational programme be carried out with the involvement of two or more independent experts and/or other (including international) external evaluators.

- **Suggestions for Programme Development**

    1. It is desirable that programme implementation staff should receive support and frequent training to develop skills in designing, measuring and analyzing learning outcomes.
    2. Provide syllabi for research components Dissertation 1 and Dissertation 2.
    3. The internal examination should be similar to the one for the master's programme in Informatics, Computer Systems and Networking at the Faculty of Informatics and Management Systems of GTU.
    4. Systematically and thoroughly inform students about plagiarism and the institution's assessment appeal mechanism.
    5. It would be better to ask more specific questions in the questionnaires for employers, because general questions cannot provide useful results for the institution.
    6. It is desirable to evaluate the programme by the graduates of the adjacent programme in terms of researching the competencies and skills needed for the modern employment market.

- **Brief Overview of the Best Practices (if applicable)**

- **Information on Sharing or Not Sharing the Argumentative Position of the HEI**

The Expert Panel received the argumentative position of the university and carefully considered its contents, which related mainly to the list of 14 recommendations in the draft report. The following alterations were made in response to the university's stated position:

1. The university claims that the knowledge areas that the Expert Panel says are not covered by the programme are indeed covered by certain courses in the programme. The Expert Panel checked this claim and concludes that, while the courses listed do touch on these knowledge areas, they are not covered in the sense that there is no strong systematic knowledge in these areas gained by the student. As an example, for "Networks and communications", the syllabus of the listed course mentions distributed computing but does not contain material on principles of networking and communications. No change was made.
2. The university insists that, in the light of their comments on recommendation 1, the qualification is correct. No change was made.
3. The university points out that the learning outcome in question refers to "**informatics tasks** related to nuclear research experiments" and claims that this is covered by the programme. The Expert Panel responds that, as explained in the text of Section 1.2 of the draft report, there is a clear connection with informatics tasks related to **particle physics** experiments, but not to **nuclear research** experiments. No change was made.
4. The university agrees and offers additional explanation. No change was made.
5. The university agrees and suggests an alternative name. No change was made.
6. The university agrees. No change was made.
7. The university agrees but suggests that the recommendation be changed to a suggestion. No change was made.
8. The university agrees. No change was made.
9. The university objects to some text in Section 2.1 of the draft report and to recommendation 9, claiming that the internal examination is fully appropriate. The Expert Panel did not have access to the internal examination for this programme, only to the ones for other programmes that are published on the website indicated. It is therefore unable to confirm that the internal examination for this programme is appropriate. The problematic text in Section 2.1 – which refers to the examination for a different programme – has been removed, and the recommendation has been changed to a suggestion.
10. The university objects on the grounds that there are no students yet. Nevertheless, the students interviewed by the Expert Panel were not fully aware of rules relating to plagiarism. The recommendation has been changed to a suggestion.
11. The university agrees and offers a suggestion about dealing with the issue. No change was made.
12. The university agrees and offers a suggestion about dealing with the issue. No change was made.
13. The university suggests that, since the problem relates to only one textbook, the recommendation be changed to a suggestion. The text in Section 4.4 has been changed to clarify that, while in the library, the Expert Panel checked the syllabus of two courses in the programme, The result of this check was that one of the two mandatory items of literature for one of these two courses was found to be missing from the library. No change was made.
14. The university agrees. No change was made.

As a result of recommendation 10 changing to a suggestion, the programme complies with standard component 2.4 instead of substantially complying, and then the programme compiles with standard 2 instead of substantially complying.

- In case of re-accreditation, it is important to provide a brief overview of the achievements and/or the progress (if applicable)

III. Compliance of the Programme with Accreditation Standards

1. Educational Programme Objectives, Learning Outcomes and their Compliance with the Programme

A programme has clearly established objectives and learning outcomes, which are logically connected to each other. Programme objectives are consistent with the mission, objectives and strategic plan of the HEI. Programme learning outcomes are assessed on a regular basis to improve the programme. The content and consistent structure of the programme ensure the achievement of the set goals and expected learning outcomes.

1.1 Programme Objectives

Programme objectives consider the specificity of the field of study, level and educational programme, and define the set of knowledge, skills and competences a programme aims to develop in graduate students. They also illustrate the contribution of the programme to the development of the field and society.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The programme objective is to train highly qualified specialists who will have theoretical and practical knowledge for:

1. Receiving and processing data from complex systems; defining strategies, methods and applications for the development of engineering geometric descriptions; adaptation of software packages to user tasks;
2. Decomposition of complex systems and separation of hierarchical structures; evaluation of topologies of engineering geometric descriptions; selection of visualization platforms according to the requirements of Metaverse applications;
3. Development of methods for solving the latest information technology tasks based on existing knowledge; solving simulation and visualization tasks in engineering geometric modeling; development of web and third-party software applications;
4. Identifying problems in the field of information technologies, determining their causes and developing ways to eliminate them;
5. To deepen collaboration with international research organizations in order to ensure interdisciplinarity and internationalization of the field.

The programme objectives are clear, realistic and can be achieved by the given programme. They correspond to the field of study and degree level and are in compliance with the HEI mission.

The programme objectives are related and mapped to the learning outcomes and can be traced to the individual courses offered by the programme. They take into account the local and international needs of potential employers and address societal needs. The programme has the strong support of senior management and faculty of the institution.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Programme Self-Assessment Report;
3. Programme objectives and learning outcomes maps;
4. Expert Panel meetings with all stakeholders

Recommendations:

None

Suggestions for the Programme Development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
1.1 Programme Objectives	X	☐	☐	☐

1.2 Programme Learning Outcomes

➢The learning outcomes of the programme are logically related to the programme objectives and the specifics of the study field.

➢ Programme learning outcomes describe knowledge, skills, and/or the responsibility and autonomy that students gain upon completion of the programme.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The programme has 9 learning outcomes:
1. Has deep and systematic knowledge of informatics tasks related to nuclear research experiments;
2. Uses this knowledge to define engineering geometric modeling requirements and select geometric models for simulation and visualization tasks
3. Considers the compatibility of software packages with the user's tasks and implements their customization;

4. Analyzes data from complex systems and interprets the results of compare analysis of geometric models using computer technologies;
5. Synthesizes engineering-design bases of devices, differentiates Metaverse application software platforms;
6. Summarizes critical cases of experiment modeling applications;
7. Evaluates the adequacy and performance of computer modeling of processes by analyzing methods for programming geometric descriptions;
8. Presents own views, research and activity results, reasoned conclusions, documentation and scientific-technical publications in various scientific, educational and commercial projects;
9. Establishes communication with the academic and professional community in Georgian and foreign languages in compliance with the ethics norms of the academic community.

It is questionable whether these outcomes meet requirements from national sectoral characteristics of higher education in information and communication technologies (ICTs), which is based on ACM curricula recommendations (https://www.acm.org/education/curricula-recommendations). According to the abovementioned sectoral benchmark document, after completing a master's degree in Information Technologies, student must have number of competences, among them:
- Information management (level 6 - highest)
- Resource planning for IT (level 6)
- Networking and communication (level 5)

None of these are addressed by the given programme. Thus, we suggest that the university provides a compliance document of the programme with the sectoral benchmark document and considers changing the programme awarded qualification to something more appropriate (e.g., 0611 Computer Use, 0688 Inter-disciplinary – involving information and communication technologies, 0788 Inter-disciplinary – involving Engineering, manufacturing and construction).

The programme learning outcomes are realistic and are mostly achievable by the programme. But it is not clear how students will achieve the first learning outcome, which relates to "nuclear research". According to the programme objectives and learning outcomes map, all courses, except "Analytical Thinking and Argumentative Discussion" achieve the first learning outcome with different levels, but none of these syllabi include topics about "nuclear research". The programme team has close collaboration with the CERN ATLAS project and that is not about "nuclear", but "particle physics". The ATLAS web page (https://atlas.cern/about) says:

ATLAS is a general-purpose particle physics experiment at the Large Hadron Collider (LHC) at CERN. It is designed to exploit the full discovery potential of the LHC, pushing the frontiers of scientific knowledge. ATLAS' exploration uses precision measurement to push the frontiers of knowledge by seeking answers to fundamental questions such as: What are the basic building blocks of matter? What are the fundamental forces of nature? What is dark matter made of?

The programme learning outcomes are logically connected to the programme objectives. They are clear, detailed and measurable. The programme learning outcomes open the possibility for students to continue their study at PhD level.

According to the Expert Panel meetings, it is clear that all stakeholders were involved in the formation of the learning outcomes.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Programme Self-Assessment Report;
3. Programme objectives and learning outcomes maps;
4. Expert Panel meetings with all stakeholders

Recommendations:

1. Provide compliance document of the programme with the national ICT characteristics document.
2. Consider changing the programme awarded qualification to one that is a better match to the programme content.
3. Modify the first learning outcome to be achievable by the programme content.

Suggestions for Programme Development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
1.2 Programme Learning Outcomes	☐	☐	X	☐

1.3 Evaluation Mechanism of the Programme Learning Outcomes

➢ Evaluation mechanisms of the programme learning outcomes are defined; the programme learning outcomes evaluation cycle consists of defining, collecting and analyzing data necessary to measure learning outcomes;
➢ Programme learning outcomes assessment results are utilized for the improvement of the programme.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

A mechanism for evaluating learning outcomes has been developed within the framework of the master's programme of Information Technologies in Nuclear Engineering based on the "Rules for Planning, Development, Evaluation and Development of the Educational Program at the Technical University of Georgia" approved by Resolution No. 01-05-04/261 of the Academic Council of GTU dated September 23, 2019.

Assessment of learning outcomes is done consistently and transparently, with periodicity specific to the field's specificity. The programme presents a map of the compatibility of goals and learning outcomes, the programme curriculum map, which shows the alignment of the course learning outcome(s) with the programme learning outcome(s) and shows to what level the programme's learning outcome(s) are being developed/achieved (introductory, deepening, mastering). The system and periodicity of the evaluation of learning results takes into account the specificity of the field and includes adequate forms and methods of evaluation, which allow determining the achievement of the learning results of the educational programme by students. The evaluation of the learning outcomes is based on the evaluation of the master's thesis, and on the other hand, the master's thesis/project evaluation criteria are defined by the master's regulations. The master's thesis/project is the research component of the master's studies and the final stage at the corresponding level of education. It includes the implementation of theoretical knowledge, practical and research abilities and skills by the student during the study period and takes into account all of the teaching results of the educational programme. Accordingly, the assessment of the master's thesis reflects the achievement of the learning outcomes of the educational programme.

However, the courses Dissertation 1 and Dissertation 2 in the curriculum map represent two different directions of the student's research, as explained by the head of the programme in the meeting with the Expert Panel, and neither of them corresponds to all of the programme's learning outcomes. This means that assessment of the master's thesis cannot measure all learning outcomes of the programme. Consequently the curriculum map needs to be reviewed to ensure measurability of programme learning outcomes by the research component or include other study courses, developing learning outcomes at mastering level to ensure complete coverage of the programme's outcomes by the corresponding components.

The use of the mechanism and the implementation of evaluations, the analysis of the academic performance of students (direct method of evaluation of learning outcomes) and the results of the evaluation of learning outcomes are monitored and compared with the target benchmarks. For each learning outcome of the programme, a target benchmark has been established that reflects the expectation that students will achieve the learning outcomes. The so-called Normal, Gaussian distribution is employed, which means that the arithmetic mean of independent and identically distributed random variables of a certain type tends to a standard normal distribution. Also, a mechanism defines the permitted deviation percentage – 20% from each target benchmark – and the measures that should be taken in case of failure to reach the target benchmarks.

GTU employs evaluation of learning outcomes of the programme using an indirect method, which involves the student's self-evaluation and evaluation by the graduates and employers. A survey form has been developed through which graduates and employers evaluate the learning outcomes they have achieved within the programme. The university operates an annual online survey mechanism of graduates and employers. The compliance of the programme results with the established target marks is determined based on the analysis of the results of this survey.

The academic/scientific and invited staff of the programme are familiar with the methods of assessment of learning outcomes; however, some of them do not have sufficient information about how the mechanism of evaluation of learning outcomes works. It is desirable that programme implementation staff should receive support and frequent training to develop skills in designing, measuring and analyzing learning outcomes.

GTU provides information on the evaluation analysis of the programme's learning outcomes to interested parties.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Programme Self-Assessment Report;
3. Map of the compatibility of goals and learning outcomes;
4. Programme curriculum map;
5. Expert Panel's meeting with the head of the programme;
6. Expert Panel meeting with academic and invited staff;
7. Expert Panel meeting with representatives of quality assurance service;
8. Expert Panel meetings with students, graduates and employers of the adjacent programme.

Recommendations:

The curriculum map needs to be reviewed to ensure measurability of programme learning outcomes by the research component or include other study courses, developing learning outcomes at mastering level to ensure complete coverage of the programme's outcomes by the corresponding components achieving all of the programme's outcomes.

Suggestions for the Programme Development

It is desirable that programme implementation staff should receive support and frequent training to develop skills in designing, measuring and analyzing learning outcomes.

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
1.3 Evaluation Mechanism of the Programme	☐	X	☐	☐

Learning Outcomes

1.4. Structure and Content of Education Programme

- ➤ The Programme is designed according to HEI's methodology for planning, designing and developing of education programmes.
- ➤ The Programme structure is consistent and logical. The content and structure of the programme ensure the achievement of programme learning outcomes. The qualification to be granted is consistent with the content and learning outcomes of the programme.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The programme is compiled according to HEI's methodology for planning, designing and development of education programmes. The content and complexity of the programme correspond to the education level and take into account the prerequisites for admission to the programme. The content and structure of the programme ensures the substantial achievement of the learning outcomes of the programme, but its compliance with the awarded qualification is questionable, as explained in Section 1.2 above.

The academic courses included in the programme are arranged consequently and logically. Prerequisites for admission to the next study component are mostly defined correctly and adequately. The only exception is the course "Analytical Thinking and Argumentative Discussion", where we think that the prerequisite "Computing and Engineering Geometry Modeling in High Energy Experiments" is not necessary.

The programme name is misleading: there is no "nuclear" in the programme's courses (see the explanation in section 1.2 above). GTU should change the name of the programme to something that corresponds more closely to its content. We suggest "Information Technologies in 3D Modeling and Engineering", or "Product Design in Mechanical Engineering" (as one of the programmes from the benchmark document is called) or similar.

The programme contains a 30 ECTS research component: accomplishment and defense of master's thesis. In the programme objectives and learning outcomes map, courses Dissertation 1 and Dissertation 2 are listed, but corresponding syllabi are not provided. As the programme head explained, there are two different directions for students' research. It would be clearer to document this and provide syllabi for Dissertation 1 and Dissertation 2.

All stakeholders were involved in the development of the programme.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Programme Self-Assessment Report;
3. Course syllabi;
4. Programme objectives and learning outcomes map;
5. Expert Panel meetings with all stakeholders

Recommendations:

1. Change the programme name to something more appropriate.

2. Remove the prerequisite from the course "Analytical Thinking and Argumentative Discussion".

Suggestions for the programme development

Provide syllabi for research components Dissertation 1 and Dissertation 2.

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
1.4 Structure and Content of Educational Programme	☐	☐	X	☐

1.5. Academic Course/Subject

➢ The content of the academic course / subject and the number of credits ensure the achievement of the learning outcomes defined by this course / subject.
➢ The content and the learning outcomes of the academic course/subject of the main field of study ensure the achievement of the learning outcomes of the programme.
➢ The study materials indicated in the syllabus ensure the achievement of the learning outcomes of the programme.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The learning outcomes of the main specialty courses correspond to the learning outcomes of the programme. The content of the courses in the programme correspond to the education level. The learning outcomes of each course correspond to the content of the given course. The number of credits allocated for each course, the hours of contact and independent work, correspond to the content of the course and the learning outcomes. The ratio between contact and independent hours corresponds to the specifics of each course. The learning methods (lecture, practical, laboratory, etc.) in each course are selected in such a way to correspond to the content of the course and the learning outcomes. The learning outcomes can be assessed in courses.

The compulsory literature of the courses mostly corresponds to the content and is modern. The course "ECMAScript Programming based on the Framework Technologies" has two main books, that do not cover all topics discussed in the content (e.g. React, Django, PHP, Laravel). GTU should make sure that the compulsory literature in all courses covers all course topics.

Evidences/Indicators

1. Master's programme of Information Technologies in Nuclear Engineering;
2. Programme Self-Assessment Report;
3. Course syllabi;
4. Expert Panel meetings with all stakeholders

Recommendations:

Review compulsory literature in syllabi and make sure that they cover all course topics.

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
1.5. Academic Course/Subject	☐	X	☐	☐

Compliance of the Programme with the Standard

1. Educational programme objectives, learning outcomes and their compliance with the programme	Complies with requirements	☐
	Substantially complies with requirements	☐
	Partially complies with requirements	x
	Does not comply with requirements	☐

2. Methodology and Organisation of Teaching, Adequacy of Evaluation of Programme Mastering

Prerequisites for admission to the programme, teaching-learning methods and student assessment consider the specificity of the study field, level requirements, student needs, and ensure the achievement of the objectives and expected learning outcomes of the programme.

2.1 Programme Admission Preconditions

The HEI has relevant, transparent, fair, public and accessible programme admission preconditions and procedures that ensure the engagement of individuals with relevant knowledge and skills in the programme to achieve learning outcomes.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The programme admission preconditions take the programme characteristics into consideration and ensure admission of students with relevant knowledge, skills and competences for mastering the programme. They require at least a bachelor's degree or equivalent and a passing result on both the general master's examination and the internal examination provided by Georgian Technical University. The programme head explained that the bachelor's degree was required to be in a STEM (science, technology, engineering or mathematics) subject. This restriction is appropriate, but it is not explicit in the programme description.

Applicants are required to have an internationally recognized certificate of English language proficiency at B2 level or to have completed a training course corresponding to B2 level. In the absence of these English language qualifications, the student is required to pass a test in the English language at GTU. These requirements to demonstrate English language competency do not apply to applicants with previous higher education in English.

Transfer into the programme from another higher education institution is permitted under the rules of the Georgian Minister of Education and Science. Transfer from another degree programme at GTU is permitted under GTU rules. Enrollment or transfer from a recognized foreign higher education institution is permitted under rules defined by Georgian legislation.

These preconditions and procedures are consistent with the relevant legislation. They are fair and – apart from the requirement that the bachelor's degree be in a STEM subject – they are public and accessible. They are logically linked to the programme content, learning outcomes, level of education, the qualification to be awarded and the language of instruction.

The requirement for English language is less rigid than the one for the previously accredited programme on Information Technologies in Nuclear Engineering, but it will nevertheless ensure the required level of competency.

An internal examination that is similar to the one for the master's programme in Informatics, Computer Systems and Networking at the Faculty of Informatics and Management Systems would be appropriate for this programme.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Programme Self-Assessment Report;
3. Expert Panel's meeting with the head of the programme;

4. Samples of tests of specialization exams for those wishing to enroll in GTU master's programs in the academic year 2022-2023 in the Faculty of Informatics and Management Systems, https://gtu.ge/Study-Dep/News/?ELEMENT_ID=20161

Recommendations:

The requirement that the bachelor's degree be in a STEM subject should be made explicit in the admission prerequisites.

Suggestions for the programme development

The internal examination should be similar to the one for the master's programme in Informatics, Computer Systems and Networking at the Faculty of Informatics and Management Systems of GTU.

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
2.1 Programme Admission Preconditions	☐	X	☐	☐

2.2. The Development of Practical, Scientific/Research/Creative/Performing and Transferable Skills

Programme ensures the development of students' practical, scientific/research/creative/performing and transferable skills and/or their involvement in research projects, in accordance with the programme learning outcomes.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The programme ensures the development of practical skills of students and their engagement in scientific research projects. An important contributing factor in the development of such skills is the opportunities that students in the programme have to do internships at the European Organization for Nuclear Research (CERN) and to be involved in projects and activities at CERN. This is possible under agreements signed between the

Technical University of Georgia and CERN, with involvement of the Nuclear Engineering Center in the ATLAS projects.

Students have in the past participated in ATLAS/CERN workshops organized by the Nuclear Engineering Center of GTU (2018: 3 students; 2017: 4 students; 2016: 5 students), in the 2018 CERN Cognitive Festival in Georgia (6 students), in CERN IPPOG Masterclasses (2018: 3 students; 2017: 5 students), and in CERN-South Caucasus Computing Workshops (2016: 8 students; 2014: 6 students; 2012: 4 students; 2010: 3 students). In meetings with the Expert Panel, students mentioned the opportunity for involvement in CERN and projects there as an attractive aspect of the programme. Employers said that involvement in projects at CERN would give students extra credibility when they are involved in complex projects following graduation.

In the framework of a practice component and/or a scientific-research project, each student is supervised by a qualified person in the field who evaluates the student's activity. The participation of students in scientific conferences and their involvement in the implementation of scientific and practical projects is supervised by the staff of the programme.

The practical component of the programme is organized and planned in accordance with the learning outcomes of the programme and corresponds to the level of education. In separate training courses, practical work is provided for students, which is deepened during work on the final project, strengthening their ability to conduct independent scientific research and contributing to the formation and development of a professional research culture.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Programme Self-Assessment Report;
3. Appendix 8 (Agreements with CERN);
4. The Expert Panel's meeting with the head of the programme;
5. The Expert Panel's meetings with students and with employers

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
2.2.The Development of practical, scientific/research/creative/performing and transferable skills	x	☐	☐	☐

2.3. Teaching and Learning Methods

The programme is implemented by use student-oriented teaching and learning methods. Teaching and learning methods correspond to the level of education, course/subject content, learning outcomes, and ensure their achievement.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The courses employ teaching methods that are relevant to the topic. The combination of teaching methods used in the training courses ensures the achievement of learning outcomes provided by the educational programme. The teaching and learning methods defined for each course are adapted to the content of the course and are appropriate for master-level study.

Teaching and learning activities include: lectures; practical work to complement the study of theoretical topics; seminars; independent study; practice; course work/projects; project development and presentation; and the master's thesis. These teaching and learning methods ensure students' active engagement in the learning process, with interaction both between students and staff and between students. They ensure student participation in the learning process with appropriate autonomy and responsibility and are aimed at the development of various skills by the student, including critical and analytical skills. In the meeting with the Expert Panel, students confirmed that theoretical courses are complemented with lab work, for example in a course on 3D design.

The individual needs and interests of students, including students with special educational needs and disabilities, have been taken into account in the selection of teaching and learning methods. For such students, an individual

study plan may be drawn up, which will take into account the student's different requirements and special educational needs, such as conducting the learning process in an adaptive environment.

Academic and invited staff take the cultural and/or other needs of international students into account while establishing teaching and learning, and assessment methods. The fact that the language of the programme is English is the most important aspect in this regard.

Evidences/Indicators

1. The master's degree educational programme "Information Technologies in Nuclear Engineering";
2. Syllabus of courses;
3. Programme Self-Assessment Report;
4. Teaching and learning methods and relevant activities, https://gtu.ge/quality/Files/Pdf/metodebi%20da%20aqtivobebi%20(1).pdf
5. The Expert Panel's meeting with students

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
2.3. Teaching and learning methods	X	☐	☐	☐

Student evaluation is conducted in accordance with the established procedures. It is transparent, reliable and complies with existing legislation.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

Objective assessment is necessary and important for students. In the submitted self-evaluation report of the institution, it is mentioned that the evaluation of students is carried out in accordance with the rules established by the law, in particular with Order No. 3 of January 5, 2007 of the Minister of Education and Science of Georgia "On approval of the rules for calculating credits of higher education programs". According to the course, the evaluation criteria are different, with assessment including group work, assignments, surveys, practical work, midterms and final exams.

5 positive evaluations are defined, as follows:

- excellent: 91-100 evaluation points;
- very good: 81-90 evaluation points;
- good: 71-80 evaluation points;
- satisfactory: 61-70 assessment points;
- sufficient: 51-60 assessment points.

Negative evaluations are:

- (FX) failed: 41-50 assessment points, which means that the student needs more work to pass and is allowed to take the additional exam once with independent work;
- (F) failed: 40 evaluation points and less, which means that the work done by the student is not enough and they have to study the subject again.

According to Paragraphs 9.6 and 9.7 of the Master's Regulations, a master's thesis is evaluated with 100 points, which is awarded by the commission. The commission consists of 5-7 members. The defense is public and the results of the commission are reflected in its protocol.

Assessment of practice in the institution is done on the basis of a practice diary and survey. During the final exam, the practice leader listens to the student's presentation and sees the completed practice diary. A student who does not have a filled in practice diary, which describes in detail what knowledge they have gained for each practice, will not be evaluated.

During the visit, the students' learning platform was inspected by the Expert Panel. There is a special graph in the platform where students can see each grade. This column also has a drop-down function which allows students to check in detail for each component exactly what score they got. Also, through this platform, students can write a statement to the Dean and send a letter to the lecturers and receive a letter from them. The platform is quite flexible and easy to understand for students.

During the visit, students were asked questions about the assessment appeal mechanism, revealing that they are not well informed about the appeal mechanism. They didn't explain well the process of where and how to appeal an assessment, but this is mainly because none of them have used or needed to appeal an assessment. Even if a student has not benefited from the assessment appeal mechanism, it is necessary for them to be well aware of their rights and to know, if necessary, to whom and where to write a statement regarding the assessment appeal.

A lack of awareness of students also concerned plagiarism and mechanisms for its recognition. They could not clearly state what program the institution uses to detect plagiarism, or what is the acceptable percentage of plagiarism. A student who is studying at the master's level and receiving a final assessment through a master's thesis needs to understand the meaning of plagiarism and to know which platform to upload the thesis for checking.

Evidences/Indicators

1. Programme Self-Assessment Report;
2. The rule of evaluation of the research component of the master's educational program, https://gtu.ge/Study-Dep/Files/Pdf/mag_debuleba_2020_SD.pdf;
3. Appendix 1 (program and syllabus);
4. Institution Forms, methods and criteria of student knowledge assessment, https://gtu.ge/quality/Files/Pdf/GEO%20critteries.pdf;
5. Appendix 10 (Instruction on the Educational Process Management at Georgian Technical).
6. Appendix 3 (planning of the educational program at the Technical University of Georgia – design, evaluation and development procedure);
7. Appendix 3 (Syllabus checking procedure);
8. https://gtu.ge/;
9. The Expert Panel's meeting with students from related programmes.

Recommendations:

None

Suggestions for the programme development

Systematically and thoroughly inform students about plagiarism and the institution's assessment appeal mechanism.

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
2.4. Student evaluation	X	☐	☐	☐

Compliance with the programme standards

2. Methodology and Organisation of Teaching, Adequacy of Evaluation of Programme Mastering	Complies with requirements	X
	Substantially complies with requirements	☐
	Partly complies with requirements	☐
	Does not comply with requirements	☐

3. Student Achievements, Individual Work with Them

The programme ensures the creation of a student-centered environment by providing students with relevant services; promotes maximum student awareness, implements a variety of activities and facilitates student involvement in local and/or international projects; proper quality of scientific guidance is provided for master's and doctoral students.

3.1 Student Consulting and Support Services

Students receive consultation and support regarding the planning of learning process, improvement of academic achievement, and career development from the people involved in the programme and/or structural units of the HEI. A student has an opportunity to have a diverse learning process and receive relevant information and recommendations from those involved in the programme.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

It is important for each student to have a student-oriented environment where they will have the opportunity to develop and gain knowledge.

The institution has a website through which students can get information about news in the institution. Also, during the meeting with students, they mentioned that information about various events is sent to them via e-mail. During that meeting, it was also revealed that self-management in the institution works quite well, as the students mentioned that they also receive information about conferences and exchange programs from them. The institution has consultation hours with a lecturer, which is agreed in advance with the Dean. Students also know about this service, therefore, if necessary, they know where and how to use the consultation hours with the lecturer.

Outside of counseling hours, students can file complaints in writing about any issue. During the meeting, two students recalled that they had a problem with one of the lecturers, about whom they recorded a complaint. The students noted that the complaint was followed by a result and a change of lecturer.

Questionnaires are periodically sent to students, where they have the opportunity to evaluate both the lecturers and the work of the institution.

During the meeting with students, they were asked questions about exchange programs and conferences, and two students who study in adjacent programs mentioned that they are going to Italy on an exchange program.

The Expert Panel inspected the technical and scientific base of the institution, as well as the CERN practice office, where two students are employed under a labor contract. Students at CERN are doing practical work; they showed us their created projects, which are also made in 3D format.

It is worth noting the honesty and involvement of employers during the program. During the meeting with employers, they mentioned that they need students who have developed technical skills and are motivated to learn.

The results of employer surveys should also be noted, where more specific questions need to be asked in addition to general questions.

Evidences/Indicators

1. Programme Self-Assessment Report;
2. Website of academic performance for students: www.vici.gtu.ge;
3. Educational electronic platform website: www.elearning.gtu.ge;
4. Appendix 3 (working groups protocol)
5. Appendix 4 (conferences in CERN)
6. Appendix 7 (Labor market analysis);
7. Appendix 8 (Agreements);
8. Appendix 12 (Surveys);
9. https://gtu.ge/;
10. The Expert Panel's meetings with students from related programmes and with employers.

Recommendations:

None

Suggestions for Programme Development

It would be better to ask more specific questions in the questionnaires for employers, because general questions cannot provide useful results for the institution.

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
3.1 Student Consulting and Support Services	X	☐	☐	☐

3.2. Master's and Doctoral Student Supervision

➢ A scientific supervisor provides proper support to master's and doctoral students to perform the scientific-research component successfully.
➢ Within master's and doctoral programmes, ration of students and supervisors enables to perform scientific supervision properly.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

For master's level students, it is very important to have an appropriate and qualified master's thesis supervisor.

Article 3 of the GTU master's degree regulations specifies who can supervise a master's thesis. The master's supervisor can be a relevant academic of GTU (professor, associate professor, assistant professor, emeritus), a member of invited staff with an academic degree of doctor, a member of staff of a Scientific Institute or Center integrated with GTU with an academic degree of doctor, or a principal or senior scientific employee with an academic degree of doctor. The supervisor may be an academic from another institution with an academic degree of doctor, if an Agreement/Memorandum has been signed between the GTU and that institution.

Once the student has selected a thesis supervisor, the student draws up a personal work plan together with the supervisor. The form that the plan should take is indicated in Appendix 1 of the Master's Regulations. The personal plan includes the title of the master's thesis, compulsory and optional subjects, and activities to be carried out for the research component.

During the meeting with students, they were asked about the topic of their master's thesis. The students said that they are not yet in the last semester, but they have information on how to choose the master's topic and how to work on it.

Paragraph 7.3 of the regulations of the master's degree explains the learning process. To make it easier for students to choose a supervisor and topic, the head of the department organizes a meeting of prospective supervisors and students, where they discuss the topics of the master's thesis and current issues. Students can change the title of the master's thesis and the master's supervisor in the first semester. After a student completes work on a master's thesis, the thesis is uploaded to a plagiarism program for checking.

During the visit to the institution, the Expert Panel saw the master's theses of students in adjacent programmes, which were done quite well and competently. The staff in the institution, who are the heads of the adjacent programs, really do have practical experience and knowledge of the field

Data related to the supervision of master's/ doctoral students	
Quantity of master/PhD theses	**0**
Number of master's/doctoral students	**0**
Ratio	**0**

Evidences/Indicators

1. Programme Self-Assessment Report;
2. Appendix 10 (Regulation of Master's program)
3. Appendix 5 (CVs of Academic staff)
4. Appendix 5 (documents for Academic staff)
5. Appendix 14 (Semester workload of staff)
6. Status of the head of the program, Resolution of the Academic Council No. 2092;
7. Instructions for managing the study process of GTU, https://gtu.ge/Study-Dep/Forms/Forms.php;
8. https://gtu.ge/;
9. The Expert Panel's meetings with students from related programmes.

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
3.2. Master's and Doctoral Students Supervision	X	☐	☐	☐

3. Students Achievements, Individual Work with them	Complies with requirements	X
	Substantially complies with requirements	☐
	Partly complies with requirements	☐
	Does not comply with requirements	☐

4. Providing Teaching Resources

Human, material, information and financial resources of educational programme ensure sustainable, stable, efficient and effective functioning of the programme and the achievement of the defined objectives.

4.1 Human Resources

➤ Programme staff consists of qualified persons, who have necessary competences in order to help students to achieve the programme learning outcomes.

➤ The number and workload of programme academic/scientific and invited staff ensures the sustainable running of the educational process and also, proper execution of their research/creative/performance activities and other assigned duties. Quantitative indicators related to academic/scientific/invited staff ensure programme sustainability.

➤ The Head of the Programme possesses necessary knowledge and experience required for programme elaboration, and also the appropriate competences in the field of study of the programme. He/she is personally involved in programme implementation.

➤ Programme students are provided with an adequate number of administrative and support staff of appropriate competence.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

Academic staff with high competence are included in the programme, which is confirmed by their scientific papers published in high-rated international journals, participation in research projects, local and international grants, trainings and international conferences. The number and workload of the academic and invited personnel implementing the programme ensures implementation of educational processes defined by the educational programme.

6 academic staff are involved in the programme, which ensures the sustainability of the programme. Academic staff actively participate in international forums, conferences and workshops. The academic staff implementing the programme includes members of international organizations - European Organization for Nuclear Research (CERN), Director of Information Technologies of the German-Georgian Joint Educational and Scientific Center (GeoGer Center), Expert of the Joint Program of the European Union and the Council of Europe (EU & CoE), US Agency for International Development (USAID) expert, United Nations Development Program (UNDP) expert, Millennium Challenge Fund (MCA) expert. They are authors of books in the field of information technologies, editors and members of the editorial board of international journals, chairmen of international conferences and forums and members of the organizing committee.

The head of the programme has experience and knowledge in the development of educational programmes. In 1992-2001, he was the head of the GTU accredited master's educational programme "Computer Design - Integrated Manufacturing Systems", participated in the TEMPUS-TACIS project at Manchester Metropolitan University, in the development of GTU study programmes and the introduction of two-level education in GTU, was the author and head of the general university training course in informatics in the master's department, is the author of 4 textbooks, which have been granted the status of study guides by the Ministry of Education of Georgia, is an expert of the Volkswagen Stiftung (Germany) scientific foundation, was an advisor to the president of the Georgian Academy of Sciences in matters of informatization (2001-2003), is a laureate of the Georgian National Prize in the field of informatization (2010), and is a scientific coordinator of collaborative projects with CERN.

The educational programme will be implemented with the support of the administrative and support staff of the Technical University of Georgia and the Faculty of Informatics Management Systems.

Half of the academic personnel have problems with the English language. They were not able to communicate well enough with experts during the meeting with academic staff. Three of the six academic staff in the programme speak good English (among them two are affiliated and one is invited). The remaining three can also speak English – no translation was needed during the meeting with the Expert Panel – but not well enough for teaching.

Number of the staff involved in the programme (including academic, scientific, and invited staff)	Number of Programme Staff	Including the staff with sectoral expertise[1]	Including the staff holding PhD degree in the sectoral direction[2]	Among them, the affiliated staff
Total number of academic staff	6	6	6	5
- Professor	3	3	3	3
- Associate Professor	2	2	2	2
- Assistant-Professor				
- Assistant				
Visiting Staff	1			–
Scientific Staff				–

[1] Staff implementing the relevant components of the main field of study
[2] Staff with relevant doctoral degrees implementing the components of the main field of study

Evidences/Indicators

1. Programme implementing personnel according to subjects;
2. CVs of the staff implementing the programme;
3. International cooperation;
4. Status of the head of the programme, Resolution of the Academic Council No. 2092;
5. Regulation of the professional development center of GTU; http://ast.gtu.ge/files/prof.debuleba.pdf ;
6. Status of the programme head.

Recommendations:

The English language ability of the academic personnel should be improved or English-speaking academic personnel should be added.

Suggestions for Programme Development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
4.1 Human Resources	☐	☐	X	☐

4.2 Qualification of Supervisors of Master's and Doctoral Students

The Master's and Doctoral students have qualified supervisor/supervisors and, if necessary, co-supervisor/co-supervisors who have relevant scientific-research experience in the field of research.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

Graduates of the master's degree programme "Information Technologies in Nuclear Engineering" will have experienced professional supervisors with many years of experience in scientific research work gained in collaborative projects with CERN. Collaboration with CERN has been ongoing since 2010, and during this period 13 projects and 25 work packages were completed; 6 master's and 3 doctoral theses were prepared; 12 scientific

articles were published in foreign refereed journals. Participated in 31 international and 146 CERN-organized scientific workshops.

Supervisors can provide consultation during the preparation of the scientific master's thesis. During the process of writing the thesis, they contribute to the process of students' integration in local and international scientific circles. In the process of research, supervisors advise students to prepare articles and publish them in refereed journals and to participate in various scientific research conferences. Master's students are informed by supervisors about different types of scientific bases, exchange programs, scientific grants and other types of activities, and will receive appropriate consultations on the correct management of their research project.

However, the number of English-speaking supervisors is not enough for the 20 students planned for the first year of the programme.

Number of supervisors of Master's/Doctoral theses	Thesis supervisors	Including the supervisors holding PhD degree in the sectoral direction	Among them, the affiliated staff
Number of supervisors of Master's/Doctoral thesis	**3**	**3**	**3**
- Professor	3	3	3
- Associate Professor			
- Assistant-Professor			
Visiting personnel			–
Scientific Staff			–

Evidences/Indicators

1. CV of the staff implementing the programme;
2. Instructions for managing the educational process at the Technical University of Georgia, https://gtu.ge/Study-Dep/Files/Pdf/sasw_proc_marTvis_inst_1407_22_SD.pdf ;
3. GTU's regulation on master's degree, https://gtu.ge/Study-Dep/Files/Pdf/mag_debuleba_2020_SD.pdf ;
4. Resolution No. 2092 of the Academic Council of GTU on the status of the head of the programme.

Recommendations:

Additional staff should be involved in supervising master's theses on the programme. The six academic staff on the programme are not enough to work with the 20 students planned for the first year.

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
4.2 Qualification of Supervisors of Master's and Doctoral Students	☐	X	☐	☐

4.3 Professional Development of Academic, Scientific and Invited Staff

➢ The HEI conducts the evaluation of programme staff and analyses evaluation results on a regular basis.
➢ The HEI fosters professional development of the academic, scientific and invited staff. Moreover, it fosters their scientific and research work.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

As part of the collaboration between GTU and CERN, every two years there are conferences/workshops organized by CERN and hosted by the Nuclear Engineering Center of GTU. At these events, the academic staff is introduced to the achievements of modern information technologies, as well as modern challenges in the field of nuclear physics. Members of academic staff conduct scientific visits to CERN every year.

The Nuclear Engineering Center of GTU regularly conducts IPPOG (Hands on Particle Physics) series of international master classes https://physicsmasterclasses.org/ twice a year. These master classes are held in parallel together with university groups from different countries around the world, and the results are summarized and verified at CERN. As a result, the students as well as the academic staff are involved in the international educational network, which contributes to the continuous development of the professional level of the academic staff.

Under the organization of the Nuclear Engineering Center, public lectures are organized with the participation of invited professors from CERN for the purpose of professional development of academic, scientific and guest personnel and involvement in scientific research:

1. 2012, Teachers' House. Participants: Professor Hans von der Schmidt; Professor Dario Barberis, CERN, Geneva, Switzerland

2. 2016, Teachers' House. Contributors: Prof. Jean-Pierre Revol, Prof. Despina Hatzifotiadou, CERN, Geneva, Switzerland.

3. 2019, Technical University of Georgia. Participants: Professor Hans Peter Beck. CERN, Geneva, Switzerland.

In GTU there is a system for evaluating the scientific productivity of the staff implementing the programme. Various bibliometric evaluation systems are used. The website of GTU (http://science.gtu.ge/) presents scientific activities of academic and scientific staff, which includes both published works, textbooks, monographs, patents, awards, being on the editorial board of journals and all possible achievements of academic and scientific personnel.

Evidences/Indicators

1. CV of academic staff;
2. Internationalization policy of GTU;
3. GTU's strategic development plan 2018-2024, https://gtu.ge/AboutStu/strategic-plan.php
4. Programme implementing staff;
5. Academic and invited staff staff trainings;
6. Results of the academic and invited staff survey;

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
4.3 Professional development of academic, scientific and invited staff	X	☐	☐	☐

4.4. Material Resources

Programme is provided by necessary infrastructure, information resources relevant to the field of study and technical equipment required for achieving programme learning outcomes.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The programme is served by the laboratory of the Nuclear Engineering Center, where laboratory work is carried out in the environment of computer-aided design systems. Three-dimensional geometric models of physical experiment devices presented in digital form are processed and analyzed in laboratory works, for which computer design system CATIA (Computer Aided Three-dimensional Interactive Application) licensed packages are used. This laboratory is used for ongoing research and training activities within the framework of collaborative cooperation with CERN. In particular, the construction of computer models of current physical experiments; study of errors of physical analysis based on mutual comparison of theoretical and real geometrical descriptions; research on integration conflicts; dynamic analysis of the installation process; building digital prototypes. A new material base has been purchased for educational laboratories and auditoriums, which includes new computerized study-workplaces; presentation and audio-video equipment; conference and classroom rooms equipped with the latest technology.

The Faculty of Informatics and Management Systems has a state-of-the-art scientific and research laboratory. It is located in a newly built educational building and is unique throughout Georgia. This laboratory is equipped with modern equipment and the latest personal computers. The laboratory base includes sub-laboratories of various profiles: artificial intelligence and databases; circuit engineering; machine-oriented programming languages and computer construction; modeling of control systems; elements and devices of control systems; metrological assurance; elements of microprocessor computing equipment; biomedical measurements and converters - Cleve Med Laboratory System; as well as a medical equipment quality assurance laboratory accredited by international ISO standards. The Faculty of Informatics and Management Systems also has a unique physics laboratory.

The website of the Technical University of Georgia contains software packages that can be used by the academic staff and students of GTU. Programs can be downloaded from the website: store@gtu.ge or from the website of the Technical University of Georgia: www.gtu.ge/ Tab: "Software packages" - link: https://e5.onthehub.com/WebStore/Welcome.aspx?ws=0b3ef5e5-719a-e311-93fa-b8ca3a5db7a1&vsro=8. Various types of licensed software packages are placed on the website.

The basic literature given in the study course syllabi is available in the GTU library. Students and academic staff have access to international electronic library databases: Scopus https://www.sciencedirect.com; www.scopus.com; Web of Science; Google Scholar; Mathematical Sciences Publisher, https://msp.org/; and the latest scientific periodicals in the field. Link: http://gtu.ge/Library/index.php.

The library of the Technical University of Georgia has access both to the database of electronic books of the library of GTU, as well as the self-evaluation report of 40 foreign educational programmes and publishers' databases. Digitization of books is underway in GTU library and currently more than 150,000 books and textbooks have been converted into electronic format. The library of GTU has textbooks from the American publishing house "NOVA" as books, the library's website: https://gtu.ge/Library/Nova/.

Students have the opportunity to use the electronic library, where Georgian language literature is located. Links: https://gtu.ge/Library/el-books/ GTU; https://gtu.ge/Learning/ElBooks/ims_books.php.

In case the student cannot find the desired textbook by e-mail from the website of the Verisia library, they have the opportunity to order the mentioned manual by e-mail and receive the electronic version of a Georgian or foreign book, magazine, or article. For this, the student must go through the registration procedures on the website: http://opac.gtu.ge/, https://gtu.ge/Library/E-mail/. Detailed instructions about this service are available on the website of GTU, in the library tab.

During the Expert Panel's visit to the library, the syllabuses for two courses in the programme were checked to see if the mandatory items of literature were present. One of the mandatory items of literature for these courses was not found in the library, neither in electronic nor physical form. Namely, only the Table of Contents of the main book "David Sawyer McFarland. JavaScript and jQuery: The Missing Manual, 2012" of the course " ECMAScript Programming based on the Framework Technologies" was found in the library in electronic form.

Evidences/Indicators

1. IT training-research laboratory of the Faculty of Informatics and Management Systems; https://gtu.ge/Ims/pdf/meecxre_korpusi_2020.pdf ;
2. University Central Library https://gtu.ge/Library/ ;

3. Access to international electronic library databases https://gtu.ge/Library/Monacemtha_bazebi/ ;
4. Syllabus of study courses, book and electronic fund available in the library of GTU.
5. Training course programs (syllabi);
6. Involvement in the international electronic library network; http://gtu.ge/Library/el-books/, http://gtu.ge/Library/Jurnalebi/, http://gtu.ge/Library/Statiebi/, http://gtu.ge/Library/Databases/

Recommendations:

All literature given as mandatory in course syllabuses should be accessible in the library in electronic or printed form.

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
4.4 Material Resources	☐	X	☐	☐

The allocation of financial resources stipulated in the programme/faculty/school budget is economically feasible and corresponds to the programme needs.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

According to preliminary calculations, the programme is financially stable and its budget will cover the financing of the necessary resources, personnel, updating of literature and other relevant costs related to the implementation of the programme.

Master's studies will be carried out with the support of partner organizations, in scientific research institutes of the university, therefore the amount spent on research is kept to a minimum.

The programme budget includes:

- Remuneration of service, academic and administrative personnel of the program, as well as remuneration of invited specialists;
- Financial provision for filling and enriching the literature;
- Necessary financial support for participation in scientific conferences;
- Financing of students' participation in educational, scientific and various types of events, etc.

Evidences/Indicators

1. Educational program "Information technologies in nuclear engineering" budget;
2. 2023 budget of the Faculty of Informatics and Management Systems.

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
4.5. Programme/ Faculty/School Budget and Programme Financial Sustainability	X	☐	☐	☐

Compliance with the programme standard

4. Providing Teaching Resources	Complies with requirements	☐
	Substantially complies with requirements	X
	Partly complies with requirements	☐
	Does not comply with requirements	☐

5. Teaching Quality Enhancement Opportunities

In order to enhance teaching quality, programme utilises internal and external quality assurance services and

also, periodically conducts programme monitoring and programme review. Relevant data is collected, analysed and utilized for informed decision making and programme development.

5.1 Internal Quality Evaluation

Programme staff collaborates with internal quality assurance department(s)/staff available at the HEI when planning the process of programme quality assurance, developing assessment instruments, and implementing assessment process. Programme staff utilizes quality assurance results for programme improvement.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

Issues related to the internal quality assurance at Georgian Technical University are coordinated by the University Quality Assurance Service together with representatives of Quality Assurance at faculties on the basis of the "Internal Mechanisms of Quality Assurance of GTU" approved by the Resolution 01-05-04/108 of the Academic Council of the University of April 17, 2018. According to the mentioned document, the Internal Quality Assurance Service of Georgian Technical University carries out the evaluation of the quality of the programme within the framework of the graduate programme.

The Quality assurance operates in accordance with the "Plan, Do, Check, Act" cycle and is used as follows: (1) programme development and approval, (2) implementation according to the curriculum; (3) monitoring, evaluation and analysis (survey of students and academic staff, analysis of student academic achievement results, etc.); (4) Consider the results and modify the programme.

The Quality Assurance Service and the faculties at Georgian Technical University are involved in the process of continuous monitoring of the services provided. Monitoring is mainly done through surveys of target groups and observation of the learning process. Survey forms include assessment of issues such as satisfaction with educational programmes, learning outcomes, assessment of management processes, infrastructure, their development needs, assessment of academic staff, material base, etc. Based on the results of the obtained information, data is processed, strengths and weaknesses are identified, problems are identified, and ways to solve them are selected.

The University has developed an internal evaluation system for quality assurance and improvement of education, according to which the internal evaluation of the presented programme was carried out. In order to fully achieve the learning outcomes provided by the programme, programme managers and academic staff were consulted and given specific recommendations that were taken into account during the programme development process.

The "Faculty Commission" established at the Faculty of Informatics and Management Systems plays an important role both in the improvement of programmes and in the internal evaluation of quality. Commission members actively participate in the process of reviewing educational programmes and are involved in the evaluation of

the study process and results. They participate in decision-making regarding the establishment of educational objectives and outcomes of the programmes and their modification.

A self-assessment report and meetings with the Expert Panel show that the University conducts an educational programme's evaluation involving academic and invited staff, interviews stakeholders, studies the market, explores new opportunities for programme development, and implements them in the programme.

The Quality Assurance Service and the staff involved in the self-evaluation report elaboration process worked not only to identify drawbacks, but also to analyze the identified weaknesses and the actions and ways to correct them, which is confirmed by meetings with stakeholders and relevant reporting protocols.

Various events and training activities are conducted by the Quality Assurance Service to develop the curriculum and improve the teaching process at the University. The Quality Assurance Service presented the list of activities / training events conducted to improve existing programmes at the University.

Evidences/Indicators

1. Master's programme of Information Technologies in Nuclear Engineering;
2. Programme Self-Assessment Report;
3. Rules of planning, development, evaluation and development of the educational programme at the Georgian Technical University;
4. Internal quality assurance mechanisms of GTU approved by resolution 01-05-04/108 of GTU Academic Council of April 17, 2018;
5. Market research;
6. Protocols of the faculty commission for evaluation of educational programmes;
7. Expert Panel meeting with academic and invited staff;
8. Expert Panel meeting with representatives of quality assurance service;
9. Expert Panel meetings with students, graduates and employers of the adjacent programme.

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
5.1 Internal quality evaluation	X	☐	☐	☐

5.2 External Quality Evaluation
Programme utilises the results of external quality assurance on a regular basis.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

Georgian Technical University uses the accreditation and authorization process of the National Center for Education Quality Enhancement for external evaluation of the quality of educational programmes. Based on the recommendations and advice received on the previous version of the educational programme of Information Technologies in Nuclear Engineering (Acc. Board decision: MES 7 20 0000936796, 02.10.2020) and other educational programmes, the University provides development and refinement of the master's program of Information Technologies in Nuclear Engineering.

The external evaluation of the programme is carried out by employers and two independent experts in the development of programme learning outcomes and programme content and structure. However, one external evaluator is at the same time an invited lecturer of the programme. Considering that the programme is new and at the same time represents a novelty for the higher education field of Georgia, it is recommended that the external evaluation of the educational programme be carried out with the involvement of two or more independent experts and/or other (including international) external evaluators.

It would also be important to evaluate the programme by the graduates of the adjacent programme in terms of researching the competencies and skills needed for the modern employment market.

The recommendations obtained as a result of the evaluation were taken into account when modifying the programme.

Evidences/Indicators

1. Master's program of Information Technologies in Nuclear Engineering;
2. Programme Self-Assessment report;
3. Internal quality assurance mechanisms of GTU approved by resolution 01-05-04/108 of GTU Academic Council of April 17, 2018;

4. External experts' assessments;
5. Expert Panel meeting with representatives of quality assurance service;
6. Expert Panel metings with graduates and employers of the adjacent program.

Recommendations:

Considering that the programme is new and at the same time represents a novelty for the higher education field of Georgia, it is recommended that the external evaluation of the educational programme be carried out with the involvement of two or more independent experts and/or other (including international) external evaluators.

Suggestions for the programme development

It is desirable to evaluate the programme by the graduates of the adjacent programme in terms of researching the competencies and skills needed for the modern employment market.

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
5.2. External Quality Evaluation	☐	X	☐	☐

5.3 Programme Monitoring and Periodic Review

Programme monitoring and periodic evaluation is conducted with the involvement of academic, scientific, invited, administrative, supporting staff, students, graduates, employers and other stakeholders through systematic data collection, study and analysis. Evaluation results are applied for the programme improvement.

Summary and Analysis of the Education Programme's Compliance with the Requirements of the Component of the Standard

The Quality Assurance Service of Georgian Technical University has developed mechanisms for monitoring, evaluating and improving educational programmes. The evaluation of the implementation of the educational programme is mainly done by surveying students, graduates, employers, academic and invited staff and by monitoring the learning process. At the end of each semester, the Quality Assurance Service evaluates courses and lecturers through questionnaires based on student surveys that are administered online. Student satisfaction with the course is analyzed and the results obtained are processed for further refinement of the programme.

The involvement of stakeholders in the process of developing the graduate programme of Information Technologies in Nuclear Engineering is confirmed. The institution submitted protocols of meetings with the staff elaborating the programme and employers' assessment of the educational programme, which describes the evaluations of participants and their recommendations and suggestions. Involvement in this process is confirmed by all stakeholders during meetings with the Expert Panel; they named specific cases of consideration of the recommendations made by them to the programme manager.

According to the programme quality assurance mechanisms, the quality assurance representatives attend lectures / practical training for monitoring, analyzing the students' academic performance and developing relevant recommendations for the improvement of the educational programme or individual study course. The results are also communicated to the teacher and, if necessary, recommendations and tips are shared with them. As the programme is new, it does not yet use developmental peer assessment, which involves academic and invited staff colleagues attending lectures and sharing feedback with each other, in order to improve the quality of teaching. However, the academic and invited staff of the programme noted their willingness to be involved in the process. The Quality Assurance Service monitors the students' academic performance, the results of which are processed according to the educational courses, instructors and faculties. Data from each faculty is reviewed by the Faculty Commission. The evaluation results are used by the university administration to improve educational programmes and the academic process. As the presented programme is new and is undergoing the accreditation process for the first time, the mentioned mechanism has not been activated yet and its implementation is planned in the future. However, the university provided the results of the analysis of the academic performance of the students on the adjacent master's programme to ensure that the mechanism is established and evaluation of programme outcomes is carried out. Based on the analysis of the evaluation results, the programme and/or evaluation system is modified / adapted to ensure its renewal.

One of the quality assurance mechanisms for Georgian Technical University is the systematic assessment of the quality of professional development of the academic and invited staff of the university, which is reflected in their submission of annual or semester reports. The reports reflect information about their achievements, participation in international conferences, publication of articles, attracted local or international grants, etc. The mentioned activity is confirmed by meetings of the Expert Panel with the stakeholders and from the CVs of the academic staff. The institution also presented separate information about academic and scientific research activity.

In the process of programme self-evaluation, the programme was benchmarked against similar programmes available at foreign universities, which is confirmed by relevant meetings with the Expert Panel. The results of the analysis are also documented.

By using the complex indicators of monitoring and programme results, the evaluation of the effectiveness of the programme is carried out and, if necessary, the programme is modified and improved.

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Evidences/Indicators

1. Master's programme of Information Technologies in Nuclear Engineering;
2. Programme Self-Assessment Report;
3. Internal quality assurance mechanisms of GTU approved by resolution 01-05-04/108 of GTU Academic Council of April 17, 2018;
4. Benchmark document with similar programmes of foreign universities;
5. Expert Panel meeting with academic and invited staff;
6. Expert Panel meeting with representatives of quality assurance service;
7. Expert Panel meetings with students, graduates and employers of the adjacent programme.

Recommendations:

None

Suggestions for the programme development

None

Evaluation

Component	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
5.3. Programme monitoring and periodic review	X	☐	☐	☐

Compliance with the programme standards

5. Teaching Quality Enhancement Opportunities	Complies with requirements	X
	Substantially complies with requirements	☐
	Partially complies with requirements	☐
	Does not comply with requirements	☐

Attached documentation (if applicable):

Name of the Higher Education Institution: Georgian Technical University

Name of Higher Education Programme, Level: Information Technology in Nuclear Engineering, Master

Compliance with the Programme Standards

Evaluation / Standards	Complies with requirements	Substantially complies with requirements	Partially complies with requirements	Does not comply with requirements
1. Education Programme Objectives, Learning Outcomes and their Compliance with the Programme	☐	☐	X	☐
2. Teaching Methodology and Organisation, Adequacy Evaluation of Programme Mastering	X	☐	☐	☐
3. Student Achievements, Individual Work with them	X	☐	☐	☐
4. Providing Teaching Resources	☐	X	☐	☐
5. Teaching Quality Enhancement Opportunities	X	☐	☐	☐

Signatures:

Chair of Accreditation Expert Panel

Donald Sannella

Full name, signature

Accreditation Expert Panel Members

Liana Zagashvili

Full name, signature

Mikheil Rukhaia

Full name, signature

Avtandil Tavkhelidze

Full name, signature

Ilia Botsvadze

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