Doc. 300.1.2

Higher Education Institution's Response

Date: Date.

- **Higher Education Institution:**
  Cyprus University of Technology
- **Town: Limassol**
- **Programme of study**
  Name (Duration, ECTS, Cycle)

  In Greek:

  Μεταπτυχιακό MSc Επιστήμης και Μηχανικής Δεδομένων
  In English:

  Msc in Data Science and Engineering
- **Language(s) of instruction:** Greek and English
- **Programme's status:** Registered but not evaluated
- **Concentrations (if any):**

  In Greek: Concentrations
  In English: Concentrations

The present document has been prepared within the framework of the authority and competencies of the Cyprus Agency of Quality Assurance and Accreditation in Higher Education, according to the provisions of the "Quality Assurance and Accreditation of Higher Education and the Establishment and Operation of an Agency on Related Matters Laws of 2015 to 2019" [N. 136 (I)/2015 to N. 35(I)/2019].

A. Guidelines on content and structure of the report

- *The Higher Education Institution (HEI) based on the External Evaluation Committee's (EEC's) evaluation report (Doc.300.1.1 or 300.1.1/2 or 300.1.1/3 or 300.1.1/4) must justify whether actions have been taken in improving the quality of the programme of study in each assessment area.*

- *In particular, under each assessment area, the HEI must respond on, without changing the format of the report:*

    - *the findings, strengths, areas of improvement and recommendations of the EEC*
    - *the conclusions and final remarks noted by the EEC*

- *The HEI's response must follow below the EEC's comments, which must be copied from the external evaluation report (Doc.300.1.1 or 300.1.1/2 or 300.1.1/3 or 300.1.1/4).*

- *In case of annexes, those should be attached and sent on a separate document.*

1. Study programme and study programme's design and development

(ESG 1.1, 1.2, 1.7, 1.8, 1.9)

Areas of improvement and recommendation

The department may want to carry out regular and formal course review. This is particularly important to this program due to the nature of the cutting edge topics covered by the program. For example, such course reviews can help the department to maintain the balance between the topics to be offered, and provide a chance to update/add/remove certain topics. In addition, these course reviews can ensure a systematic review about the amount of assessments expected by the students and ensure a balanced workload throughout the academic year. Furthermore, these course reviews could be also helpful to improve the sustainability of the program by bridging the gap between the learning outcomes of the program and the skills expected in the job market.

In addition, the department may want to carry out formal moderation to the assessment and marking. At this stage, such assessment moderation has been carried out by relying on the individual faculty members who produce the assessment. It could be useful if formal moderation is carried out to check the appropriateness of the assessments, before they are passed to the students. Similarly, it is useful to have a type of moderation activities to check the markings. The department has acknowledged the importance of this, and also informed the EEC that this type of practice has not been carried out in the university formally. Nevertheless, the department may want to consider a pilot for this useful academic practice.

Responses to suggestions for improvement and recommendations

The department has taken all comments and suggestions of the External Evaluation Committee into extensive consideration and has introduced the following procedures to carry out and maintain regular and formal course review.

At the end of each academic year, the department will hold two course review meetings of the permanent personnel involved in the programs. The course review committee comprises permanent academic staff, the program coordinator and the head of the department. During this meeting, the committee will review the quality and research and industrial relevance of each course and will identify areas of improvement.

Each course instructor, together with the coordinator, has the responsibility to regularly update the content and the bibliography of each course where necessary. The librarian assigned to the department assists with the renewal of the digital subscriptions and with ordering new books, magazines and journals where needed.

Furthermore, the course review committee will assess the purpose and objectives of each course and its learning outcomes. They will also review the general profile of the program and will proceed with amendments in existing course syllabi where needed.

In addition to the course review committee the department will establish an external Advisory Board comprising three industry experts and two academics from other universities. These will be experts with which the department is already collaborating through various funded research and/or education projects. The committee will consult each external advisory board member to identify gaps between the learning outcomes of the program and the skills expected in the job market. f

Moreover, the committee will assess and revise the workload of each course. Specifically, 1 ECTS corresponds to 25 hours of workload per semester. In the outline of each course, a table will present in detail the students workload to ensure a balanced workload throughout the academic year.

Every three years, a similar meeting will be held, this time involving all teaching personnel of the program, the coordinator and the head of the department. The program review committee will investigate the introduction of new courses and/or replacement of the existing courses where needed and will determine their content.

As a first result of this internal review process, the committee is considering to replace the Advanced Topics in Architecture and Parallel Computing with a Natural Language Processing course. We consider the NLP course as offering more industrially relevant knowledge to our graduates. The Natural Language Processing course will be taught by Dr. Sotirios Chatzis.

In addition, the department has decided to institute a peer review process of the exams and grading. Under this newly established process, each course instructor's exam papers and samples of graded papers will be reviewed by another instructor in the department. The additional pair of eyes will ensure consistency with the course syllabus and marking fairness. We intend to extend this process by introducing exam peer assessors from other universities in Cyprus as soon as the required budget to hire external services is secured.

Student – centred learning, teaching and assessment

(ESG 1.3)

Areas of improvement and recommendations

Students' feedback is crucial to the development of any teaching program. Currently, the department provides opportunities to students for feeding their suggestions back to the department, by asking each student to complete a questionnaire about each course at the end of each semester. This questionnaire contains both the suggestions to the course as well as to faculty members who deliver the course. Additional feedback mechanisms could be provided to students if they want to provide suggestions at the program level. In addition, regular student-staff meetings can also be useful for the interaction between the department and students, where a few student representatives can be selected and asked to attend such meetings. Furthermore, such staff-student meetings can also be used as venues to inform the students what actions have been taken by the department for the students' feedback.

This program is about data science, which is a subject closely related to industries. Because of the nature of this program, students enrolled on this program can benefit a lot if formal partnerships between the department and industries can be established. As such, students can have more opportunities for carrying out their placement and internship. More interactions between the department and the enterprise and career office in the university can also be helpful towards this purpose.

Responses to suggestions for improvement and recommendations

The Department has introduced the following procedures in order to provide additional mechanisms for students to provide feedback.

The students will complete on a yearly basis evaluation surveys of their Instructors and the Courses they have been taught. This is an addition to the standard per course evaluation submitted at the end each semester. Furthermore, the standard per course evaluation form is currently being updated by the University to be more detailed and to allow easy extraction of statistics. The annual course review committee will analyse the evaluation form submissions, present and discuss them during its meetings. The review committee informs the instructors about the results concerning their taught by giving constructive and comprehensive feedback for further development and improvement.

At CUT, there are suggestions & complaint boxes where students can place their suggestions, comments or proposals about the university in general or specifically about their Lecturers and/or their taught courses. This procedure provides useful feedback, allows the students to have their own voice in the university and contributes to the upgrading and development of CUT and its offered programs of study. Students can place their suggestions and/or complaints anonymously if they wish or they can make their identity known. The suggestions, complaints, comments or proposals are made known to the relevant committees at CUT which take action where necessary promptly and with professionalism.

Students participate in committees at CUT and it is very well known amongst them that their voice can be heard. Students have also their own Student Union which represents and promotes the interests and welfare of the students in CUT. Through the Union's activities the students' interests, integrity, freedom and speech is safeguarded. The Union encourages the representation and involvement of students in the university's decision making and makes efforts to improve the quality of life and education for the students. Members of the Union participates in the department's committees and in organizing athletic, educational, social and other activities beneficial to both the university and the students.

Events for career counseling are organized throughout the year where students can get valuable information about their studies and their employment opportunities. CUT has collaborations with a variety of companies not only in Limassol but in other cities as well. Available employment or internship positions are made known to students and the university's policy is to encourage and connect students to the industry in order to develop a meaningful, structured on-the-job training experience which is directly linked to students' academic coursework and/or degree. The aforementioned experience aligns students' career goals and objectives with existing learning and employment opportunities. Furthermore, CUT has an Alumni Association, which supports the university's goals and strengthens ties between alumni, existing students and the university. Many qualified graduates are invited at CUT as visiting professionals to speak about their profession to existing students. In addition, the department maintains a Facebook group for its graduates, where alumni regularly post job openings. This allows fast dissemination of job opportunities and the cultivation of our graduates' alumni network.

2. Teaching staff 7

(ESG 1.5)

Areas of improvement and recommendations

The EEC has identified lack of training support and therefore, it recommends the development of systematic central support menu with regards to staff induction, mentoring and further development. The EEC has also realised that there are no procedures for staff peer review and therefore it recommends for the development and implementation of a relevant procedure. In particular, a minimum of didactic & pedagogical training should be compulsory to all staff. This is the reason why teaching staff development is assessed as partially compliant.
Finally, the EEC recommends that targeted efforts are made to recruit female academic staff of high scientific calibre.

Responses to suggestions for improvement and recommendations

We thank the committee for highlighting a crucial weakness in our program and the development of our faculty.

The department, and the program coordinator in particular, will devote special attention to safeguarding that new staff undertake new duties for which they have been properly trained and mentored. Not only the department, but CUT in general as an education community, promotes academic freedom and research independence amongst its members.

Therefore, only general-purpose guidelines can be put in place in terms of career development, quality of research and teaching, educational methodologies, etc. Each faculty member is free to develop her/his teaching and research pillars as see fit. Staff peer review takes place during the promotion of faculty members (after 3 or 4 years depending on the rank).

Furthermore, each member submits her/his yearly research and teaching achievements to the university's institutional registry (https://ktisis.cut.ac.cy/). The member's performance along various research axes is assessed and is tied to a small yearly lump sum that is given to faculty members for research purposes.

Instituting further faculty assessment methods would be cumbersome as a new process would have to abide by all relevant Cypriot legislation (university law, labor law, etc). If a procedure is not

included in the current legislation (and in the established university policies) we need to tread carefully when it comes to implementing it. Such assessment procedures would have to go through all other internal (i.e. at the university level) and possibly governmental bodies (Ministry of Education, the Parliament etc.).

Regarding the suggestion for a minimum of didactic & pedagogical training that should be compulsory to all staff, this may violate the terms of employment for academic personnel as it adds to their workload. As a department we will make every effort to have this issue investigated at the Senate level and propose best practices.

Nevertheless, within the aforementioned restrictive legal framework, the department intends to make full use of the resources provided by the university. In particular, the department encourages all staff currently teaching in our program to attend lectures and study training material offered by the Learning Development Network (http://ldn.cut.ac.cy/el/).
The Network aims at: the design and implementation of seminars and workshops based on innovative teaching practices, the promotion of exchanges of good teaching practices, the contribution to the design of long-term educational policy of the University, the support of the work of new teachers, the teaching of new teachers in learning, teaching and assessment, and the coordination and operation of new, modern learning spaces at the University.

Lastly, the department fully agrees that more effort should be made towards recruiting female academic staff. As a computer-science-oriented department, we face the worldwide issues of gender imbalance that plague our discipline over the last decades. At the same time, according to the current legislation, the advertisement of a new position should provide equal opportunities for both male and female candidates. Therefore, targeting colleagues of a certain gender would constitute discrimination. Nevertheless, we are aware that we receive proportionally fewer applications from female candidates.

We will address this discrepancy by making concerted efforts to draw the attention of female candidates to new positions through personal communication of faculty members with external colleagues within our networks of collaborators. At the same time, we are in the process of using all the available resources offered by ACM-W (https://women.acm.org/) to adjust our outreach methods and make our department a more attractive work destination for female faculty.

3. Student admission, progression, recognition and certification *(ESG 1.4)*

Areas of improvement and recommendations

The evaluation committee thinks that an area of improvement of the Master is concerned with the number, quality and gender balance of the admitted students. Given the worldwide high-interest in data-science (many of the new IT professions are in the data science area), more motivated students could be enrolled by switching from greek to english. This could also give a more international flavour to the master. Another way to improve the population of students, is to try to increase the number of female students: the evaluation committee suggests to faculty to take some specific action to make the programme more attractive to women.

Another recommendation for attracting motivated students is concerned with the possibility to personalize the curriculum of studies. The current structure of the programme includes all compulsory courses, excluding only one elective course. Typically, students with high scientific and technological skills, also have specific interests; giving the possibility to customize the studies, or proposing alternative curricula, could be a way to attract them.

Another area of improvement is concerned with the percentage of students who withdrew, and the urgent need for a structured process to monitor and improve this. This is the reason why the student progression standards are partially met. Note that the statistics on student numbers that were submitted as part of the department's application were different to the statistics that were given by the department after the on-site visit following a request by the EEC. The evaluation committee suggests that the faculty formalizes a specific quality assurance process, having a particular focus on this aspect. Some metrics or KPIs should be identified and monitored with a predefined timing during the academic year. Specific documents, that follow a predefined format, should be periodically edited, by reporting comments of the metrics as well as indicating specific actions to be taken to improve (when possible) the monitored situation. Processes of this type are already among the implicit "good practices" of the Master, but the suggestion is to make this quality assurance process formalized and explicit, and to make sure that the correct statistics are always easily accessible.

Responses to suggestions for improvement and recommendations

Based on the comments of the evaluation committee the department will look carefully into the issues regarding the number, quality and gender in order to create a balance of the admitted students. We will make concerted effort to attract more female students in the program, In particular we can offer scholarships to female students and place emphasis on retaining female students from the undergraduate program. We also intend to use networking resources by ACM-W to render our program more attractive to underrepresented genders.

With respect to the language of instruction, all course material (lecture slides, books, exam test, etc.) are already almost exclusively in English. In addition, instructors switch to exclusively English in-class delivery when foreign students take the course (e.g., Erasmus students). In theory, the program can switch from Greek in-class delivery to English almost seamlessly. Greek delivery has become the main practice in our program because it was originally designed to draw students from the Cypriot and Greek market. We believed that Greek-speaking students would find our program more accessible if taught in Greek thus giving us an edge over the private university programs in Cyprus. In the meantime, we have realized that this choice severely limits our prospective student body, therefore we have decided to switch to exclusive English teaching. This switch involves going

through the required accreditation process and getting the necessary university and CYQAA approvals.

In full agreement with the committee's suggestions, we will include more elective courses to allow students to customize their study. As we hire more new faculty over the next 2 years, the addition of new courses will become more streamlined.

With regards to the statistics, the correct version is the one presented during the on-site visit. We rely on the central university student services for these statistics and there was probably a misinterpretation of student status on their part during the submission of the application. In addition, the numbers reported were updated to reflect progress during the period between the application submission and the on-site review.

We will address this issue of reliable student statistics by maintaining separate student statistics at the department level. We will use those statistics for sanity checks when comparing them with the figures given by the university. The correct statistics concerning current students, newly admitted ones, withdrawn, etc., will be carefully investigated at the annual course review meeting where we will also assess whether particular courses contribute to attrition. As per the committee's suggestions, we will institute a formal and document-driven procedure for the analysis of student performance so that the annual course review committee can extract actionable conclusions.

Nevertheless, over 6 years of operation, the program managed to graduate more than 30 students, which is a relatively high number adjusting for the scope of the program, the available positions, the number of faculty involved, and the commensurate figures of other programs offered in Cypriot public universities. In exit interviews with a sample of students who have withdrawn from the program, we have identified two main causes of attrition: a) the student has to deal with a busy work schedule (often in a highly demanding ICT job); or b) students who come from a non-CS background have a hard time catching up with the required background knowledge. To ameliorate those two causes, our academic advisors convey to the students that with proper scheduling they can complete the program in part-time mode over 4 years, while working or acquiring the proper background. We will ensure that the necessary planning information is conveyed to the students as early as possible in their studies. We believe that with additional monitoring by the academic advisors we will manage to reduce the number of withdrawals.

4. Learning resources and student support

(ESG 1.6)

Areas of improvement and recommendations

It is highly recommended to ensure the continuous funding of the infrastructure that supports the program. This includes lab infrastructure and relevant to the program software. It seems that the University does not have sufficient financial resources to guarantee this.

It is important to improve teaching with external visiting staff to enrich teaching and connect it with the industry.

Students should be encouraged to familiarise themselves with cloud providers and state of the art infrastructures, such as training Machine Learning models on GPUs, not only as part of their theses, but also during their courses.
The allocated resources for funding the infrastructure and for the operation of the department and the continuous improvement of the quality of its programs of study need to be reevaluated.

Responses to suggestions for improvement and recommendations

We fully agree with your recommendation regarding the improvement of the program's infrastructure, laboratory equipment, software etc. As a department we keep asking funding for this purpose from the early years of the program's operation. However, the overall state funding for the university, in the last 8 years has been reduced to a level that it can barely cover staff salaries and usual operations, as a result of the continuing crisis.

One of our core data science and engineering courses learning goal is to familiarize students with cloud providers and state-of-the-art infrastructures, such as training Machine Learning models on GPUs, not only as part of their thesis but also during their courses. During the course CEI 523 "Data Science" become familiar with frameworks that are de facto standards for deep learning, especially applied to video and language understanding tasks, which lie at the core of the module; namely PyTorch and TorchVision. Students can run experiments on Google Colab which provides cloud computational resources (12GB GPU at google cloud). In addition, students have access to servers with the following specifications: CPU: intel i7-5820K 6 cores (12 threads) 3,6 GHz GPU: P6000 Quadro 24GB RAM: 64GB.

In addition, the course CEI 526 "Advanced Topics in Data Processing System" covers scalable distributed data processing systems such as MapReduce, Spark, and NoSQL databases (e.g., MongoDB) for performing data-driven large scale analytics. The graduate students familiarize themselves with such technologies and get practical experience with them through a semester-long project, during which the students must implement some application that runs using the aforementioned systems. The students can also get access to a local 11-node compute cluster located at the University's datacenter in order to execute their application in real settings and better understand the distributed nature of many modern applications.

Also we would like to mention that our department collaborates with large companies, not only in Cyprus but also in other countries, e.g. Telefonica Research. In multiple occasions, researchers

from these companies visit the department and offer guest lectures or seminars in advanced courses like CEI 523 and 524.

The department will make every effort to further improve the computing infrastructure and access to Big Data cloud services made available to students. In addition, we will make a serious effort to recruit industry experts to teach an elective course and highly industrially relevant course in our MSc program.

5. Additional for doctoral programmes

(ALL ESG)

N/A

7. Eligibility (Joint programme)

(ALL ESG)

N/A

B. Conclusions and final remarks

The EEC reviewed and examined the materials provided by the Cyprus University of Technology pertaining to its Master's Degree Program in Computer Engineering and Informatics of the Department of Electrical Engineering, Computer Engineering and Informatics. The one-day site visit was held on 17.6.2021.

The EEC was presented with detailed information about the degree program. During the site visit, the EEC met university, school and department leadership peers and met professors, teachers and administrators. It also met current and past students of the program.

Based on the examination and evaluation of the accreditation materials and the remote site visit, the EEC concludes that the required standards are met fully, with the exception of staff development and student progression, which are partially met.

The EEC identified the following key strengths:

- This programme adheres to international standards with respect to topics, quality of teaching, resources and infrastructures.
- The department maintains a national strength in research, and integrates research activities into teaching.
- The students on the programme have been well looked after, particularly during the Covid-19 pandemic.
- The programme enjoys a good staff-student ratio, which means that each student can get sufficient support.
- Staff expertise is consistent with the program of study and it seems that they receive appropriate support to undertake research. This is evident by the strong research output of the staff involved in this program.
- There is a well balanced mixture of foundational and applied topics in this MSc programme.
- The employability of the students who completed the programme is very high.
- The programme has a very good administrative and managerial structure and support.
- The small size of the department allows for effective informal solutions to operations issues.
- Students are highly satisfied with the quality of learning and teaching resources.

The EEC also identified a number of key areas for improvement and therefore, the following recommendations are made:

- The EEC recommends that the department carries out regular and formal course reviews, the aggregated results of which are fed back to the students (anonymously).
- The EEC recommends that the department carries out formal moderation to the assessment and marking.
- The EEC recommends that student feedback mechanisms are provided to students at the programme level.
- The EEC has identified lack of training support for staff and therefore recommends the development of a systematic central support menu with regards to staff induction, mentoring and further development. The EEC recommends that a minimum of didactic & pedagogical training should be compulsory to all staff.
- The EEC recommends that targeted efforts are made to recruit female academic staff of high scientific calibre.
- The EEC recommends that the number and gender balance of admitted students and student dropout should be monitored precisely and and should be subject to a targeted strategy aiming to improve it.

- The EEC recommends that the department ensures the continuous funding of the infrastructure that supports the programme. This includes lab infrastructure and relevant to the programme software.
- The EEC recommends that the department continues to improve teaching with external visiting staff and connections with industry.

Responses to the recommendations of conclusions

We owe a debt of gratitude to the EEC for performing such a thorough, informative and helpful evaluation of our program. This external evaluation has proved to be a valuable tool for the improvement of our graduate program of study. We have addressed each recommendation point in detail in the previous sections. Overall, we commit to make every effort to introduce the recommended mechanisms in our internal quality assurance processes. In the following paragraphs, we further discuss some of the key recommendations and weaknesses identified.

The current teaching and research labs, and university facilities in general, are of high quality. Nevertheless, we will pursue further investment in our computing infrastructure (currently mostly residing in the university's datacenter) and will provide students with streamlined access to cloud computing services like Google Colab, Digital Ocean, and Amazon AWS. Several of our Masters thesis have been completed with intense use of such local and cloud resources revealing the complementarity of research and teaching activities of the teaching faculty. This is particularly interesting because it has led to former graduates being absorbed in high- profile industries or they hold academic positions in prestigious institutions.

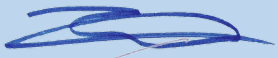
In addition, the ratio of number of students-to-lecturers is very good. Most classes have less than 20 students per professor. With regard to admission requirements, formal control points have been established to ensure high-calibre students enter the university at all levels. Moreover, MSc student supervising/mentoring follows the same standards and practices of top academic institutions from around the world. MSc students get introduced to research topics through their coursework and aim at attaining original research results through their thesis project. Some of our students have published their research in reputable journals and conferences.

To ensure the consistency of taught material with the examinations, we will introduce a peer review of exam papers and sample-based assessment of marking. In addition, our course review committees will rely heavily on student feedback to inform improvements in our course content and the program overall.

Additionally, we plan to establish a staff support system that will include induction, training, mentoring and further development as it is described in your recommendations. We will require some financial support from the university, which we expect to get soon after the current crisis is over. Regarding the establishment of a compulsory didactic and pedagogical training to all staff as well as well as using external teaching staff, we will try to achieve is, although, for a public university, this is something that it controlled centrally by the university, and occasionally from the government.

Lastly, the department will devote time and resources to ensure our faculty openings are properly advertised to the entirety of the candidate pool with an emphasis on female candidates. The department fully acknowledges the importance of gender balance in our program, so we will make every effort to attract or retain female students by following the appropriate guidelines as offered in the international literature and the university's internal policies.

C. Higher Education Institution academic representatives

Name	*Position*	*Signature*
Takis Kasparis	Professor, Chair	
Andreas Andreou	Professor, Program Coordinator	
Michael Sirivianos	Assistant Professor, Program co-coordinator	
Click to enter Name	Click to enter Position	
Click to enter Name	Click to enter Position	
Click to enter Name	Click to enter Position	

Date: 02/10/2021