

2023

# Education Quality Assurance and Assessment Policy

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## 1 Introduction

This document is an integrated update of the departmental quality assurance policy with the departmental assessment policy. Integration of these two departmental policies is necessary because of the intrinsic relationship between the topics of these two policies. This document takes a process oriented approach to arrive at an effective and efficient quality assurance.

This integrated policy takes into account the strategic vision on education, quality assurance and assessment. A strategic vision on these topics is essential to ensure that we achieve the intended learning outcomes of our programs. It is through a proper alignment of our education activities that students can acquire the knowledge and skills of the intended learning outcomes and thus allow lecturers to fulfil their educational tasks in an effective and pleasant way. We can only achieve this alignment if all stakeholders (students, lecturers, support staff and management) feel committed to contribute to high-quality education and thus create a department-wide quality culture. In order for this quality culture to be beneficial for all stakeholders, we must strive for sustainability and aim for a way of working that goes beyond individual curriculum elements and includes higher levels such as learning lines and trajectories. Since our department offers several programs, we also aim for intensive collaboration and alignment between the different programs.

The current policy describes how the TU/e Exam framework 2019 (de Haan, van de Watering, & van Meeuwen, 2019), the TU/e Education Quality Assurance Framework 2020 (Havekes & van de Watering, 2020) and the TU/e Educational Fraud Policy 2015 (van Meeuwen & Kraak, 2015) have been implemented within the department. It is a cohesive system of measures and provisions taken by the Department of Mathematics and Computer Science to monitor and enhance the quality of its educational programs, the quality of testing, and the quality of the examinations (definition of the Education Inspectorate). This document was written by the Quality Assurance Officer and the Policy Advisor of M&CS and has been adopted by the Department Education Board. The Program Committees and the Examination Committees of all programs have been consulted. The document has been established by the Department Board of M&CS.

## 1.1 Abbreviations and definitions

Table 1. Abbreviations and definitions

Abbreviation or Term	Definition
<b>Assignment</b>	All types of interim tests that students work on at home or during lectures/tutorials, and which are handed in and assessed (van Meeuwen & Kraak, 2015).
<b>CC</b>	Curriculum Committee
<b>EC</b>	Examination Committee
<b>EQA</b>	External Quality Assurance External quality assurance in its various forms can verify the effectiveness of institutions' internal quality assurance, act as a catalyst for improvement and offer the institution new perspectives. It will also provide information to assure the institution and the public of the quality of the institution's activities.
<b>ESA</b>	Education and Student Affairs
<b>Examiner</b>	An (external) examiner is an official who is responsible for an individual study component of one or more degree programs at TU/e and is appointed by the Examination Committee of the governing department/degree program to assess students by organizing examinations for the study component and determining the results (Model Regulations of the Examination Committee, 2020).
<b>Formative assessment</b>	Assessment that encourages students to study regularly and to provide insight into their progress
<b>ILO</b>	Intended Learning Outcome
<b>IQA</b>	Internal Quality Assurance
<b>LL</b>	Learning Line
<b>M&amp;CS</b>	Mathematics and Computer Science
<b>NVAO</b>	Nederlands Vlaams Accreditatieorganisatie (Accreditation Organization of the Netherlands and Flanders)
<b>PC</b>	Program Committee
<b>PD</b>	Program Director
<b>QA</b>	Quality Assurance
<b>Summative assessment</b>	Assessment that determines whether the student has sufficiently mastered all learning objectives of a course
<b>TU/e</b>	Eindhoven University of Technology

## 1.2 Reading guide

This policy document breaks down as follows, we start with the M&CS vision on education in chapter 2, followed by the M&CS statement on quality in chapter 3 assurance and the M&CS statement on assessment in chapter 4. Chapter 5 will be devoted to the Internal Quality Assurance cycles, firstly on program level, secondly on learning line level and lastly on course level. Chapter 6 is on the Assessment processes within the department. Chapter 7 is the M&CS implementation of the TU/e Fraud policy, and Chapter 8 indicates the link between the NVAO External Quality Assurance standards and our Internal Quality Assurance system. In the appendices you can find roles and responsibilities with QA and Assessment, an evaluation plan, a list of evaluation tools, the questions in the teacher feedback form, the question in the several standardized course evaluation surveys, the annual education evaluation overview and the process of curriculum changes.

## 2 Alignment with vision on education

The M&CS department is committed to the mission and vision of TU/e to educate Eindhoven engineers with a distinct T- or  $\pi$ -shaped profile. We educate students to become responsible engineers who are prepared to take on important societal, technical and scientific changes and have a deep understanding of their discipline, know how to keep their knowledge and skills up to date, and are able to work on complex systems in multidisciplinary settings and teams.

This policy is aligned with the M&CS education vision. Education is changing in our fast pacing world. Our educational vision will adapt to these changing circumstances when needed, and our quality assurance policy will change accordingly.

We educate “future proof” engineers with solid knowledge of mathematics, computer science or data science and with the required professional skills. Learning to learn, critical thinking, solid design and research skills, the ability to make own choices, provide motivated design decisions, and the ability to communicate are essential competences of an Eindhoven engineer.

### 3 TU/e definition of Quality of Education

The university Quality Assurance Framework (Havekes & van de Watering, 2020) mentions that the TU/e regards achieving a high quality of education, measured by external national and international standards, as an essential precondition for its activities. Three aspects of education quality form the basis for the design of the quality assurance system at TU/e:

- ✓ Quality is the extent to which education meets (inter)national standards (for example, the Accreditation Organization of the Netherlands and Flanders (NVAO) and the Dublin descriptors defining the learning outcomes for programs at universities and universities of applied science).
- ✓ Quality is the extent to which education meets the predefined (learning) objectives within a course, a study program, and the Bachelor College (BC) and the Graduate School (GS) as a whole.
- ✓ Quality is the extent to which education satisfies the wishes, expectations, and needs of stakeholders, such as students, alumni, the professional field, society and the government.

#### 3.1 M&CS Statement on Quality Assurance

*Since the TU/e quality definition is focused on satisfying expectations and meeting statutory and legal requirements, we included elements related to quality culture and commitment to continuous improvement:*

At M&CS, we foster a shared quality culture of mutual trust and ownership in which management, lecturers, support staff, and students feel safe and committed to maintaining and improving our education quality.

We support this quality culture by employing improvement cycles at the program, learning line, course, and individual level (continuous professional development of lecturers and support staff).

Our internal quality assurance system approach facilitates a link to external quality assurance processes.

*The elements of our statement (quality culture, improvement at various educational levels, and connection to external quality assurance) are incorporated and further developed in the chapters of this policy.*

#### 3.2 Quality Assurance objectives

Aligned with	Topic	Objective
TU/e definition of Quality of Education	Statutory and legal requirements	Ensure that the M&CS curricula meet national and international standards. (for example: NVAO, Dublin descriptors add IEEE, ACM guidelines)
	Meeting satisfaction and expectations	Evaluate stakeholders experience with our programs and identify their needs by developing feedback cycles at program and course level.
M&CS Statement on Quality Assurance	Quality culture	Foster a quality culture of trust, ownership, and commitment to continuous improvement.
		Provide a safe environment and the instruments to foster our quality culture effectively.
	Continuous improvement	Structure our improvement cycles and generate concrete, tangible plans for the improvement of education
		Align the outcome of evaluations and action points with the annual report process.

## 4 Statement on Assessment

*To ensure that our students meet the intended learning outcomes of our programs, it is essential that our programs have a comprehensive assessment vision:*

Course assessments should fit the learning objectives and learning format of a course, taking into consideration that within programs different forms of assessment are used (de Haan, van de Watering, & van Meeuwen, 2019).

Assessments influence the behavior of students and what students learn. Formative assessment is used to provide feedback during the course and summative assessment is used to evaluate student learning at the end of a course. Programs use a mix of formative and summative assessment (de Haan, van de Watering, & van Meeuwen, 2019).

Assessments are reliable, valid, transparent, efficient and assure achievement of course learning objectives. The curriculum design assures achievement of the program's intended learning outcomes (de Haan, van de Watering, & van Meeuwen, 2019).

## 5 Quality Assurance processes

To achieve the goals mentioned in chapter 3, we need clearly defined quality assurance processes that go beyond measuring students' satisfaction through surveys. Here, we will describe the intended quality culture, our quality assurance processes, the stakeholders involved, and the QA instruments.

Our quality assurance processes are organized into four components: program, learning line, course, and individual level. We trust that the stakeholders in these processes comply with their "quality" responsibilities.

Furthermore, because the quality of education has a tremendous human aspect focused on the professional development of academic and support staff, attention will be paid to this in the last section of this chapter.

### 5.1 Program level

Our QA aim at program level is to ensure that all curricula are relevant to the current (and future) field developments and society's needs and provide a valuable learning experience to our students. We achieve this by having adequate learning outcomes with an appropriate assessment plan, learning lines aligned with the program intended learning outcomes (described in Section 5.2), a proper education distribution of education over clusters, relevant content, flexible teaching methods and student support that enable a smooth student progression.

To ensure the implementation of the previous elements, we use instruments like the curriculum design document, the program and examination regulations (PER), the annual assessment plan, the study guide, and student mentorship (Academic advising). In addition, we monitor the quality of our programs by implementing feedback moments with students, alumni, industry, and society, and analyzing administrative information through QA reports. The combination of QA results at course level with these instruments makes it possible to monitor quality at program level.

The Program Director is responsible for evaluating the curriculum and the program as a whole and is accountable for the quality of education to the Dean BC or Dean GS, and to the Department Board. The Program Director is responsible for communicating the quality assurance results to students and other relevant stakeholders.

#### 5.1.1 Documents to ensure program quality

The department has several documents that are used to ensure the quality of the program. These documents are described in this section.

##### 5.1.1.1 Curriculum design document

A curriculum is a systematic and intended packaging of learning outcomes that students should acquire through organized learning experiences. The curriculum per program is described in a curriculum design document. This document is developed for each program. The goals of this document is to describe the general setup of the curriculum and how all Intended Learning Outcomes are achieved for a specific cohort.

The contents of the curriculum design document are:

- The underlying philosophy and principles of the curriculum structure;



- The Intended Learning Outcomes of the program and the comparison with a benchmark statement or other institutions;
- A table and explanation showing the connection between the learning objectives of the courses and the program ILOs and that the ILOs are being achieved;
- An explanation of how students develop their professional and research skills;
- An explanation of how students acquire the relevant knowledge and technical skills;
- The learning lines, or areas within the program;
- The preferred or required order of courses within the program or within a learning line;
- Bachelor programs: how the professional skills are embedded in the program, including the way of assessing and providing feedback;
- Bachelor programs: the setup of the curriculum in the first year in relation to the selection function;
- Master programs: how the scientific skills are embedded in the program.

This document is updated when the curriculum changes or when the Intended Learning Outcomes of the program change.

For each program, clear descriptors are formulated in line with the Dutch qualification framework (Dutch Qualification Framework (NLQF)) and meeting international requirements. The starting points are the Dublin Descriptors (Bologna Follow-Up Group, 2005) and the 3TU Criteria for Academic Bachelor's and Master's Curricula (Meijers, Overveld, & Perrenet, 2005).

The Program Director is responsible for formulating the Intended Learning Outcomes. The Department Council has advisory rights, and the Program Committee has the right of approval. If the ILOs change significantly advice is asked from an external advisory board with representatives from industry and academia. The Intended Learning Outcomes of each program are included in the Program and Examination Regulations.

#### **Procedure to update the curriculum design document**

Proposed changes in courses are communicated to the Program Coordinator before the set deadline<sup>1</sup> as will be announced by the Program Coordinator. The Program Coordinator makes an overview of the changes. Under the responsibility of the Program Director, the Program Coordinator, in collaboration with the Policy Advisor will update the curriculum design document. The Program Committee, Examination Committee and Department Board will be consulted. The Program Director will establish the curriculum design document. The curriculum design document will be published on the intranet and students and lecturers will be informed.

#### ***5.1.1.2 Program and Examination Regulations***

The Program and Examination Regulations (PER) are a legally binding document in which the applicable procedures and rights and obligations with regard to education and assessment are laid down. (Wet op het hoger onderwijs en wetenschappelijk onderzoek). This includes:

- The contents of the program

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<sup>1</sup> <https://tuenl.sharepoint.com/:w/s/MCSteam/EWfyUlcB5F1DmrnJgBz3xtoBq45Rmz2Nldw59mvGllsqtw?e=fj7rNk>

- The intended learning outcomes of the program

### **Procedure to update the Program and Examination Regulations**

The Executive Board establishes a Model PER. The policy advisor education adapts the main body of the document with the departmental information. The Program Coordinators update the program specific parts in the appendices. After approval of the Program Director, the policy advisor education will lead the process of establishing the document by consulting the Examination Committee, Program Committee and Department Council. The Board will establish the PER.

#### *5.1.1.3 Annual assessment plan*

The goals of the program annual assessment plan (Guideline Graduate School 2020, 2020) and (TU/e Bachelor College Guideline, 2020) are

- ensure that there is alignment between the learning outcomes and the assessment form of the mandatory or core courses,
- ensure that there is a balance between group assessment and individual assessment,
- ensure that there is a balance between project work and written exams.

#### **Procedure to update the annual assessment plan:**

Lecturers communicate proposed changes in the assessment of study components to the Program Coordinator before the announced deadline. The Program Coordinator makes an overview of the changes. Under the responsibility of the Program Director, the Program Coordinator, in collaboration with the Policy Advisor, will update the annual assessment plan. The Program Committee, Examination Committee and Department Board will be consulted. The Program Director will establish the assessment plan. The assessment plan will be published on the intranet and the students and lecturers will be informed.

### **5.1.2 Instruments to monitor program quality**

Besides the written documents to assure program quality mentioned in 5.1.1, we describe the instruments to monitor program quality and for improvement in this section, such as program/curriculum surveys, cluster review sessions, and statistical information. The midterm review is explained separately in section 8.2.

#### *5.1.2.1 Surveys to monitor program quality*

All surveys (at the course and program level) have a *signaling* function, which helps the management, program committees and examination committees to determine which study components may require attention. The results of quality assurance instruments (in particular those addressing student satisfaction) are not intended as a direct measure of educational quality (TU/e Education Quality Assurance Framework, 2020).

We distinguish between internal and external program surveys. The first are standardized surveys designed and managed by the TU/e, and the second ones are handled by external bodies such as the government.

#### 5.1.2.1.1 Internal surveys

The TU/e conducts internal surveys annually within the Bachelor College and Graduate School for all programs. The coordination of these surveys is the responsibility of the central TS&QA division of ESA Service (Havekes & van de Watering, 2020).

In addition to the standard set of questions, the option of adding program-specific questions is offered. Within MCS, we aim to connect the program-specific questions with the annual objectives of the program to measure its progress and effectiveness. The departmental quality assurance officer advises the Program Director on this matter.

**Transfer survey:** In order to measure student satisfaction with the transition of previous education to the bachelor or master program, we request all first-year bachelor's and master's students at TU/e to complete the Transfer Survey around December/January. The survey includes the following topics: the process of choosing a study program, satisfaction with the program and achievement so far, satisfaction with the student mentor, satisfaction with the information provided, and an overall program rating.

**End-of-year survey:** This survey aims to evaluate the students' last year experience and determine which program elements are going well and which aspects need improvement. All TU/e students (Bachelor, pre-master, and first-year master) receive the End-of-Year Survey at the end of an academic year. The topics per student group are presented in the table below:

Topic	BC1	BC2	BC3	PM	GS1
Motivation, orientation, and selection	x	x		x	
Organization, information, setup, and support	x	x		x	x
Student mentor and academic advisor	x				
Professional skills	x	x			
Electives		x			x
Value of different elements and aspects of the program			x		x
Wellbeing	x	x	x	x	x
Self-efficiency			x	x	x

Table 2. Overview of the topics in the End-of-the-Year survey per student group

#### 5.1.2.1.2 External surveys

**NSE:** In order to evaluate student experience with our programs and benchmark with other universities and programs, the TU/e participates in the National Student Survey (NSE) every year. The NSE is a national student survey that is sent to all students in higher education institutes in The Netherlands. The NSE usually opens in January and closes in March. The results are reported in June. The coordination of the NSE and the implementation at TU/e is the responsibility of central TS&QA and the BI division of ESA Service. (TU/e Education Quality Assurance Framework, 2020)

**NAE/Alumni Monitor:** To evaluate alumni perception, expectations of the professional field and identify needs, two surveys are conducted among alumni. The initiative for and the coordination of the TU/e Alumni Monitor is the responsibility of the CEC Service, while the implementation is carried out by the ESA Service. TU/e also participates in the external National Alumni Survey (NAE), which is commissioned every two years by VSNU. Unlike the TU/e Alumni Monitor, the NAE offers the possibility of comparing the TU/e programs to the national average and specifically to comparable programs elsewhere in the country (TU/e Education Quality Assurance Framework, 2020). The follow-up actions of these surveys results are described in section 5.1.3.

#### *Procedure for program surveys preparation*

Central QA organizes the survey logistics; however, the departmental QA officer is responsible for connecting the activities and deadlines with the appropriate stakeholders. The QA officer informs the program coordinator about the deadlines to provide program-specific questions and advises on this matter. The program coordinator discusses the questions with the PD. Then, the QA officer makes sure that the questions proposed are incorporated in the survey.

#### *5.1.2.2 Administrative information sources/BI-Tools*

The main purpose of this instrument is to ensure the quality of our programs by monitoring the performance and making decisions based on the analysis of results and trends of our educational statistics like the binding recommendation on the continuation of studies (BSA), intake/transfer, diplomas and study duration, drop-out, and switch, international experience, study success, diversity inclusion and internationalization.

#### *5.1.3 Program evaluation reports and program improvement plan*

##### *Program Surveys Reports*

To help management, program committees and examination committees to signal study components that may require attention, the QA officer and the Program Coordinator analyze the results of internal and external program surveys and come up with provisional conclusions and action points, focusing on the effects on the program objectives. After that, the QA officer discusses this preparation with the Program Management, a student and a staff member from the Program Committee. Urgent issues identified during the meeting are addressed to make swift actions. The main conclusions and action points are mentioned later in the annual report.

##### *Annual Education Report*

The objective of the Annual Report process is to recalibrate and connect management of the departments Education Programs to enable these to contribute to the achievement of the department's long-term vision and goals.

The Annual Education Report is a formal instrument in which the Program Director reflects annually on not only the results of the implemented education policy but also the actually executed educational programs, reporting to the Dean BC/GS and the Education Board. The Annual Education Report of the study program explicitly reflects on education policy objectives and how these relate to the vision for the to be executed educational program, the results of the educational evaluations and subsequently initiated improvement trajectories. Other key guidelines are the improvement plans resulting from the recommendations of the latest accreditation visitation.

##### *Procedure for creating the Annual Education Report*

The PDs receive a formal request from the BC, and GS deans with the content desired or questions to be answered. The policy advisor shares the TUE guidelines, aligns the process within our department, provides the format and coordinates the writing and alignment of the report. The individual program reflections are used to compose one departmental annual report, with a departmental chapter focusing on relevant issues for multiple programs and chapters per domain.

The program coordinators collect all the relevant data and, together with the QA officer, propose provisional conclusions and action points. Furthermore, the reflection should look forward to the next academic year by proposing objectives and improvements connected to our educational vision.

The Program Management discusses this reflection in a Program Management meeting on program quality with a student and a staff member from the Program Committee. The outcome of this session is used to fine-tune the Annual Education Report.

Moreover, during the Program Management meeting previously mentioned, we decide whether or not a program requires urgent actions, an improvement plan or no actions based on the program evaluations and aspects evaluated in 5.1.2.2 . For every program, there are three options:

### 1. Good and no action required

The Program Management concludes that the program evaluation and aspects evaluated in 5.1.2.2 looks good and that there is no need for any further action. Usually, this will be the case if the quantitative scores from the students survey are average to good (overall program rating  $\geq 6$ , ratings of separate aspects  $\geq 3$ ) and if the qualitative results from the students survey, and other input (study association, administrative information) do not signify any significant issues or action points.

### 2. Minor issues → (a) more information needed, or (b) no action required

(a) The Program Management concludes that some aspects of the program need improvement and concludes that they need more information. This may for example be the case if the number of students who completed the evaluation is very low. In this case, the QA Officer or Program Coordinator will take action to gather more input, ask the PD some specific questions, or have a focus group with some students who followed the program. After having gathered the missing or additional information, the Program Coordinator will report back, after which the program management will decide if they are convinced that the program is doing fine and no further action has to be taken or if they will move on to the next step, i.e. proposing an improvement plan.

(b) The Program Management concludes that there are some minor issues with the program. Examples of this situation are: there is a new curriculum, and there are some growing pains; there were issues, but they were caused by an external factor that will likely not be present in the next year (e.g., a pandemic was happening); there were issues, but the Program Director proposes convincing action points to tackle these issues next year. The action points are included in the Annual Education Report so that next year it can be checked if the issues have been resolved.

### 3. Major issues → improvement plan required

The Program Management concludes that the program is not performing well in some of the aspects evaluated and that major issues need to be addressed. Therefore, the Program Director writes an improvement plan and shares it with the Program Committee.

Issues at cluster level or learning line level are addressed and can be taken into the Cluster Review Sessions or learning line teams. However, urgent matters may lead to immediate actions.

When the Annual Education Report is finalized, the program management discusses the report with the Dean BC/GS during the review meetings.

### *5.1.3.1 Program Improvement Plan process*

#### *1. After the Program Management meeting:*

The Program Management, the Dean BC/GS, and the Educational Board will discuss at least the following topics:

- a. the Annual Education Report and how the PD looks back at it;
- b. the plans for improvement;
- c. the support needed.

#### *2. Before starting the new academic year:*

The Program Coordinator has a preparatory session with the Program director before starting the new academic year. They discussed the implementation of improvements that were described in the Annual Education Report: is it all going according to the plan? Are there any issues with the implementation? Is more help needed?

#### *3. During the AY:*

The Program Director can monitor the progress of the improvement plan by using any of the evaluation tools mentioned in Appendix C or by adding questions to the student satisfaction survey to measure whether the suggested improvements are successful. Also, the Program Coordinator and QA officer will closely monitor the program by, for example, attending student feedback sessions.

The program management will update the program committee about the progress of the program improvement plan after gathering and analyzing the program evaluation results.

#### *4. After the end of the AY:*

Once the academic year has ended, the Program Coordinator and QA officer incorporate the relevant information related to the program performance into the Annual Education Report (see 5.1.3). During the Program Management meeting on program quality, they conclude if the improvements were successful or not. If the improvements were not successful, we take additional actions, for example, gathering more information or proposing a new improvement plan.

### *5.1.3.2 Cluster Review Session*

The cluster chair is responsible for dividing the duties of the cluster and to engage in consultation with the management regarding education (Departmental Regulations, 2022). The goal of this instrument is to monitor overall teacher-course performance, assignment of teachers to courses, capacity, well-being of lecturers, positioning of the cluster within learning lines, and points for improvement like training needs, staffing, and follow-up of course improvement. Cluster Review Sessions will be organized twice a year to ensure timely feedback. The program management and the cluster chair join these meetings.

## **5.2 Learning line level**

For every program, learning lines are already or will be defined by a curriculum committee or under the responsibility of the Program Director. These learning lines consist of courses that build upon each other or that work on the development of (professional) skills or that are in a similar sub-area or theme of the program. Each learning line has specific learning goals that contribute to the overall learning goals of the program.

### 5.2.1 Instrument to monitor learning line quality

Monitoring learning quality requires a special approach since a learning line consists of several courses. The Program Management initiates at least once a year a meeting between lecturers of the courses in a learning line. Topics that will be discussed in such meetings include alignment of courses (do previous courses in a learning line provide the necessary prerequisites (knowledge, skills) for later courses), comparison of assessment methods and updates of alignment of learning line with the program Intended Learning Outcomes.

## 5.3 Course level

Our QA aim at course level is to ensure that all courses are connected to the programs' intended learning outcomes, that they are designed to comply with the three elements of constructive alignment (a learning process that properly aligns *learning goals, teaching and learning activities and assessment methods*), with an adequate study load, and flexible teaching and learning strategies.

At the course level, our lecturers are responsible for delivering good education. They can use several tools to ensure, monitor, and improve course quality, such as course design documents, round table discussions, student evaluations, and improvement plans.

Additionally, we discuss the performance of individual courses in a Program Management with representatives of the program committees.

We evaluate the adequacy of learning objectives, activities and assessment, student feedback, teacher reflection, alignment with learning line and program intended learning outcomes, and success rates.

### 5.3.1 Written document to ensure course quality

#### 5.3.1.1 Course design document

To ensure that a course complies with the quality requirements mentioned in 5.3, the responsible lecturer should use the course design document containing a description of the learning goals, teaching activities, assessment approach, course material, etc.

For each course basic information is provided within Osiris, concerning lectures, assessment, literature etc. Learning objectives have been defined by the responsible lecturer in line with the didactical constructive alignment framework. Attention is paid to the formulation of learning objectives in the UTQ training. The learning objectives are stated in the course catalogue. Moreover, changes in a course's learning objectives need to be approved by the Program Management and incorporated in the curriculum design document and the program assessment plan. The learning objectives of the courses within a learning line should be well aligned and contribute to the Intended Learning Outcomes of the program. The process of the curriculum changes is described in Appendix G.

### 5.3.2 Instruments to monitor course quality

Lecturers should select one or more instruments as to allow program management and quality assurance officer to monitor the quality of the course. For instance, they can prepare the revision of a course by using an evaluation plan (Appendix B); this tool allows them to evaluate, for example, the impact of changes in teaching methodologies, didactics, learning activities, and course materials. Their primary sources of information are students, teachers, and peers (colleagues and educational/content experts). See Appendix C for the list of evaluation instruments.

The instruments related to course feedback sessions and student satisfaction surveys are further explained in this chapter.

### *5.3.2.1 Round Table Discussion (RTD)*

The main goal of the RTD is to provide a space for dialogue among students and lecturers to reflect on the course and the students' learning process by identifying good practices and possible improvements to implement while the course is still ongoing. The RTD are sessions with students initiated, organized, and hosted by the educational officer of the study associations involved, GEWIS (for computer science and mathematics) and Pattern (for data science). In the bachelor programs, these sessions are hosted every quarter. In addition, separate sessions for each year of the different bachelor programs are organized, where students, relevant teaching staff, program coordinator, quality assurance and academic advisors are invited. The courses taught in the current quarter are discussed with attention for different aspects: lectures, course material, instructions, homework, and actual topics related to the year objectives. Furthermore, students provide constructive feedback to lecturers about what is going well and what can be improved, and lecturers can ask students questions.

The RTDs are organized in the middle of the quarter, which gives the opportunity to hear about potential problems and good practices early on and still have time to implement improvements. Students feel heard, and lecturers have a valuable opportunity to gather feedback.

Due to the relatively low number of mandatory courses in the master programs, the RTD's organization is slightly different from the bachelor. The Program Coordinator asks students during the quarter which courses to discuss. A session is organized for these courses, and the Program Coordinator together with the educational officer invites students and lecturers.

### *5.3.2.2 Course student satisfaction survey*

All surveys (at the course and program level) have a *signaling* function, which helps the management, program committees and examination committees to determine which study components may require attention. As we mentioned before, the results of quality assurance instruments (those addressing student satisfaction) are not intended as a direct measure of educational quality (Havekes & van de Watering, 2020) Because course surveys may suffer from biases and low response rates, the result are always interpreted with care and used together with other sources of information.

We evaluate courses with more than ten students using TU/e standard questions every quarter to keep track of courses and ensure historical data per academic year and facilitate comparison. There are three types of surveys: short surveys, extended surveys, and surveys for project-based courses; Appendix E contains the questions. Courses with less than ten students can use any of the instruments mentioned in Appendix C.

#### *Procedure for student satisfaction surveys*

Before the new academic year, the Program Coordinator provides an overview of the courses with major changes, new courses, and new lecturers. These courses will have an *extended* course evaluation. Furthermore, to ensure that lecturers following the UTQ training are evaluated, the UTQ coordinator provides an overview of lecturers doing their training. A lecturer can always decide to use additional tools to gather more information about the quality of their course, as mentioned in 5.3.2

Each quarter, the MCS quality assurance officer prepares the surveys by checking the type of course, checking whether it needs the extended survey and whether there are courses with an improvement plan. The MCS quality assurance officer decides upon the evaluation date and determines MCS-wide



survey questions based on the annual department objectives. The responsible lecturers of the courses can propose course questions and check all other information.

Students and lecturers can see the survey results after students share their constructive feedback and the survey deadline passed. However, we do not share teacher scores and answers to open questions with students. Responsible lecturers can reflect within Evalytics (TU/e's evaluation management system) upon aspects like, for example, positive outcomes, student feedback, results of other instruments used, bottlenecks, changes, improvements, and assessment. Moreover, to promote student engagement in quality assurance, teachers can respectfully acknowledge student feedback via Evalytics.

Program Directors and the Quality Assurance Officer can see the complete results and the teacher feedback on Evalytics.

We describe the procedure of reporting, discussing results, and improvement in chapter 5.3.3.

*Student satisfaction surveys of the Internship, Final Project, and Graduation Project*

After completing the Bachelor's final project, Internship or Master's Graduation Project, all students will receive a standard survey. Such surveys give an insight into how students perceive these projects.

By the end of the academic year, the MCS Quality Assurance Officer analyses the results and produces a list of possible points of attention together with the Program Coordinator. We discuss the survey results within the Program Management, and the outcome is shared with all teachers involved and on Canvas Page.

### 5.3.3 Course evaluation report and course improvement plan

At M&CS, we consider that Quality Assurance is broader than only measuring students' satisfaction through surveys. We combine different types of input: feedback sessions in which students and teachers participate, student surveys, exam results and Teacher's input. Together, we define how to improve our courses with concrete actions.

Evalytics generates a survey report for each course, including the response rate, the average answers to all questions, the satisfaction with teachers and instructors or tutors, the course-specific questions, and the open-ended questions. Next to that, the MCS Quality Assurance Officer produces a Course Evaluation Report per program per quarter, including the quantitative results of the courses evaluated during the quarter, the quantitative results of last three academic years, the success rates, average grade from BI-tools, teacher responses, results on M&CS questions in relation to the specific program, and to check previous action points, a summary of actions implemented in upcoming quarters. The Program Coordinator and the QA officer analyze these results and come up with provisional conclusions and action points per critical course and program. We discuss this preparation during the Program Management meeting on educational quality with a student and Teacher from the PC. All participants receive the course evaluation report, the individual course results and the general overview with action points and advice. During this meeting, we decide if a course requires an improvement plan or not. For every course, there are three options:

1. Good → no action required

The Program Management concludes that the course evaluation overview of a specific course looks good and that there is no need for any further action regarding this course. Usually, this will be the case if the

quantitative scores from the student survey are average to good (overall course rating  $\geq 6$ , ratings of separate aspects  $\geq 3$ ) and if the qualitative results from the student survey, the input from the Teacher, and other input (study association) do not signify any significant issues or action points.

## 2. Minor issues → (a) more information needed, or (b) action required

(a) The Program Management concludes that the current course evaluation overview does not convince them that the course is of sufficient quality and concludes that they need more information. This may for example be the case if the Teacher's evaluation is still missing or if the number of students who completed the evaluation is very low. In this case, the QA Officer or Program Coordinator will take action to gather more input, ask the Teacher some specific questions, or have a focus group with some students who followed the course. After having gathered the missing or additional information, the Program Coordinator will report back, after which they will decide if they are convinced that the course is doing fine and no further action must be taken or if they will move on to the next step, i.e., requesting an improvement plan. This can be announced in the coming meeting.

(b) The Program Management concludes that there are some minor issues with a course. Examples of this situation are: the course is new, and there are some growing pains; there were issues, but they were caused by an external factor that will likely not be present in the next year (e.g., a teacher was ill; a pandemic was happening); there were issues, but the Teacher's evaluation includes convincing action points to tackle these issues next year. The action points are included in the meeting notes so that next year it can be checked if the issues have been resolved.

## 3. Major issues → improvement plan required

The Program Management concludes that a course is not performing well and there are major issues that need to be addressed. Therefore, the PD requests an improvement plan from the responsible lecturer. The PD, or someone mandated by the PD, will contact the responsible lecturer to set up a meeting to discuss the current edition of the course in depth and to explain the process of developing, implementing, and evaluating an improvement plan. This improvement plan is shared with the PC.

### 5.3.3.1 Course Improvement Plan process

To achieve our QA goal related to continuous improvement, "*structure our improvement cycles and generate concrete, tangible plans for the improvement of education*" the approach to identify, propose and monitor improvements is the following:

#### 1. After the program management meeting:

The PD, or someone mandated by the PD, and the responsible lecturer will discuss the following topics:

- a. the last edition of the course and how the responsible lecturer looks back on it;
- b. the plans for improvement;
- c. the process of developing, implementing, and evaluating the improvement plan;
- d. the support needed.

Then, the responsible lecturer writes an improvement plan. The teacher supporter can assist if needed (5.5.2). Next, the lecturer sends the plan to the Program Director, Program Coordinator, and QA officer. Finally, after the Program director approves the Improvement Plan, the responsible lecturer starts its implementation. The Program Committee receives the Improvement plans each quarter (if there is any)

as described in section 5.4., to fulfill their monitoring and advising role. Furthermore, the Program director will report frequently when improvements or issues happen.

## 2. Before starting the course:

The PD, or someone mandated by the PD, has a preparatory session with the Responsible Lecturer before starting the new course iteration. They discussed the implementation of improvements that were described in the improvement plan: is it all going according to the improvement plan? Are there any issues with the implementation? Is more help needed?

## 3. During the course:

The Responsible Lecturer can monitor the progress of the improvement plan by using any of the evaluation tools mentioned in 5.3.2 or by adding questions to the student satisfaction survey to measure whether the suggested improvements are successful. Also, the Program Coordinator and QA officer will closely monitor the course by, for example, attending RTDs.

## 4. After the course:

Once the course has ended, the QA officer highlights the course in the Course Evaluation Report and incorporates the relevant information related to the improvement plan results. After the Program Management takes place, the Program Coordinator notifies the Responsible Lecturer whether they conclude the improvements were successful or not. If the improvements are not successful, we take additional actions, for example, gathering more information or requesting a new improvement plan. The conclusion is shared with the program committee as part of the outcomes of the Program Management meeting.

### 5.3.4 Interdepartmental/interinstitutional course review

Our department collaborates with other TU/e programs and Dutch universities by either delivering courses (service education), sharing programs (joint programs), or cooperating with courses (Mastermath).

#### 5.3.4.1 *Service Education*

To ensure the quality of the courses that MCS delivers for programs outside our department, we discussed them during the quarterly course review sessions (5.3.3) and later with the teachers involved in the specific department. In addition, the quality assurance officer of the external program can share their QA feedback to incorporate it into the discussion. The Program Coordinator is responsible for organizing the conversation with teachers.

#### 5.3.4.2 *Joint Programs*

The evaluation of the courses is primarily the responsibility of the offering department or institution. Still, we incorporate the student satisfaction results in the MCS's quarterly course evaluation report.

**Master Embedded systems:** This program is offered together with the Electrical Engineering Department. The MCS quality assurance officer analyses the courses that both departments offer. However, the quality assurance officer of EE is responsible for evaluating and gathering the necessary course information from their department.

We discussed the ES courses first during the evaluation of the CSE courses and later during the Program committee meeting as described in 5.3.3.

**Bachelor Data Science:** This program is a joint program offered with Tilburg University (TiU). The MCS quality assurance officer analyses the courses that both institutions offer. However, we evaluate the major courses and electives offered by TU/e, and TiU evaluates the electives offered by them.

We discussed the BDS courses every quarter as described in 5.3.3. Moreover, the program management and program committee have representatives from both universities to ensure transparency and alignment in the decision-making process.

**Mastermath:** It is a collaboration of all Dutch mathematics master's programs. It has its own management board and has a quality assurance process of its own. All courses are evaluated by survey and the results are discussed twice per year in separate meetings with the program directors, student representatives and program committees of all involved universities. Actions are discussed in the joint meetings of program directors with the Mastermath board.

## 5.4 Involvement of Program Committee

The program committee plays an essential role in proactively monitoring the entire quality assurance processes. In particular, it monitors the improvement plans, reflects on the result of the improvements, and gives the Program Director solicited and unsolicited advice on the quality of education.

We want to foster a quality culture of trust and ownership. One of our QA goals is to enable Program Committees to go beyond the course level by also monitoring quality at program level. The Program Committee is expected to direct their discussions at a high level and less course detail-oriented.

At program level, the PC is consulted to approve the curriculum design document, the program and examination regulations, and the annual assessment plan. Moreover, the PC is informed about the results of the program surveys results, and the outcome of the cluster and learning meetings. (see sections 5.1 and 5.2). Additionally, The Program Management discusses the Annual Education report in a Program Management meeting on program quality with PC representatives. This session is used to reflect at least on the program performance, results of improvement plans and goals for the next year (see 5.1.3)

At course level, PC is consulted to approve the course design document. Moreover, the PC representatives in the Program Management meeting receive the course evaluation reports, the individual course results, and the general overview with action points and advice. The PC representatives can advise in those meetings as well. (See section 5.3). The reports discussed in the Program Management meeting and the action points can be used as input for the PC meetings. Furthermore, the PC provides advice when necessary to the PD. The PC discusses individual course results with the PD only through its representatives during Program Management meetings.

## 5.5 Human dimension

To ensure high quality of education, the human dimension is of the utmost importance. Our educators meet competence criteria and further develop their teaching qualifications and English proficiency to provide an excellent education. Therefore, we consider the lecturer the course owner and responsible for delivering a good learning experience to our students.

Newly appointed assistants, associates, and full professors (after June 1, 2010) are required to obtain the University Teaching Qualification (UTQ) within three years after taking on the position. HR is responsible for informing newly appointed staff about the UTQ process.

At TU/e, most courses are delivered in English. All teaching staff is required to take the English Language Assessment (ELA). TU/e expects teaching staff to be at C1 or C2 level. After taking the ELA, the TU/e Language Center can facilitate by providing English language courses if necessary. HR is responsible for documenting the ELA.

The Program Director is a member of the appointment committee for job hires and promotions to assess the teaching competences of the candidates. The PD ensures that teaching competences are part of the advice to the board. TU/e encourages and facilitates the continuous personal development of its professionals. Teachers have free access to high-quality training programs, tailored to specific groups and situations, and are able to deepen or broaden their expertise. For example, the TEACH training program offers a variety of options to improve didactical skills, teaching qualifications and customized training. Likewise, the TU/e Language Center can facilitate the improvement of English proficiency by providing English language courses.

### 5.5.1 Teacher's Rewards

Outstanding performance on educational quality is acknowledged and rewarded by the program management.

Teaching is decided to be one of the four domains of excellence of the core of good performance, next to research, valorization and organization & management within TU/e. Academic staff has to develop in all domains which are also used in the promotion of academic staff. Within MSC we acknowledge outstanding teaching performance and effort for improvement offering teacher's rewards .

From 2022-2023 teacher's rewards are decided during the Program Management meeting. If there are disagreements among the participants, the Program Director/Manager makes the final decision based on several sources: for example, the effort of a lecturer to design a new course or redesign a course, the feedback in the round table discussions, and student surveys. In addition, lecturers, students, and other personnel involved in the course can send a suggestion to award a lecturer with a reward by sending a motivation to the Quality Assurance Officer. The Program Management discusses all proposals or thinks of their own proposal and makes a final decision. As mentioned in previous sections, the Program Management meeting on educational quality will have Program Committee representatives who can advise the program director on this matter. The program committee will be informed of the decision after the meeting next to a motivation of the reward. Finally, the support staff will arrange the handing out of the rewards.

### 5.5.2 Teacher and Course Support

#### *Course Support Team*

To support our lecturers in teaching, the MCS Course Support Team provides didactical advice for, for example, (re)designing a course and using digital educational tools. CST can also assist with practical or technical teaching issues.

#### *Education Innovation Group*

The group focuses on supporting teaching within MCS and the research into and development of innovation in academic education. The EdIn groups coordinates and supports innovation in education on a case-to-case base as well through innovation projects. The group is also the portal for lecturers to 4TU.CEE initiatives.

### 5.5.3 TU/e Education Innovation Fund

To encourage innovation in education and to support lecturers in their efforts to design and improve their study programs, the Bachelor College and Graduate School have made available the Education Innovation Fund<sup>2</sup>, which is part of the 4TU sector plans. To encourage educational innovations a thematic call is issued each year, allowing lecturers to acquire funds to start up innovation initiatives. The innovation projects are managed via the 4TU.CEE. The Education Innovation group (EdIn) within the department is funded by these innovation funds.

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<sup>2</sup> For more information, please visit the intranet page <https://intranet.tue.nl/en/education/4tucee/tue-innovation-fund>.

## 6 Assessment

This chapter describes the assessment policy of the Department. We start with the key principles of assessment (reliable, valid, transparent, and efficient), these principles help to assure the quality of assessment. In 6.2, an overview is presented on what assessment method fits for which type of course. In the last section the link between the QA tools and procedures to assure the key principles of assessment are listed.

### 6.1 Key principles of assessment

Every assessment should be reliable, valid, transparent, and efficient (de Haan, van de Watering, & van Meeuwen, 2019).

**Reliable:** The assessment makes a meaningful distinction between the students who easily meet the learning objectives, and those who do not. The quality of the assessment plays a role here (individual ability, minimal chance of guessing the right answers, and lack of ambiguity), as do the circumstances in which the assessment is held (standardization and objectivity) and the method used for assessing the results (objective, deliberate, and accurate).

**Valid:** The assessment covers the intended learning objectives. Content (consistent with the intended learning objectives), level (the degree of difficulty) and a good representation of the subject matter are key aspects of validity.

**Transparent:** Before the assessment, it is made clear to students how they will be tested, and on what subject matter.

**Efficient:** The information obtained through testing outweighs the examiner's investment (test development and correction and test taking) and students' investments, especially in terms of time.

Examiners have the primary responsibility with respect to reliability, validity, transparency, and efficiency of the course assessment. In Section 6.3 these key aspects are linked to measures, actions and quality assurance processes discussed in the next sections. The Examination Committee has the task of safeguarding these key characteristics. Procedures for this are laid out in the Regulations of the Examination Committee.

Instructors, tutors, or student-assistants can be involved in assessment procedures if the reliability and transparency can be guaranteed. The primary responsibility remains with the examiner. The restrictions for students-assistants are written down in the Regulations of the Examination Committee.

### 6.2 Assessment method fits the learning format

All courses are assessed with a method that fits the learning objectives and the learning format of a course. In general:

Educational activity	Assessment methods used
Lecturer-centered course <sup>3</sup> (a course in which the lecturer determines in detail the topics and assignments of a course)	A combination of written exam (open book or closed book), (group) assignments, and /or oral exam. Use of intermediate and final (e-) assessments.

<sup>3</sup> Lecturer centered refers to traditional education where the teacher passes knowledge to students: <https://teach.com/what/teachers-know/teaching-methods/>

Design-based learning projects/courses (DBL)/ Challenge-based learning projects/courses (CBL)	A combination of various methods to be determined by examiners: individual testing of theory by means of written exam (optional), skills assessment, registration of attendance, peer review, individual input in final discussion, individual contribution to group process, final discussion with the group, written reports, oral presentations and/or posters, skills.
Bachelor's final project	Final report, reflection report, presentation.
Internship	Final report.
Graduation project	Final report, presentation, oral defense.

With the increasing deployment of blended learning formats, new types of assessment are introduced. New types of assessment should be agreed upon by program management and the responsible examination committee.

### 6.3 Link between the key aspects of assessment and the QA tools and procedures.

This section elaborates on the link between reliability, validity, transparency and efficiency of assessments, and the procedures and processes in place to guarantee those within the Department. The TU/e Central Examination Regulations (Eindhoven University of Technology, 2019) describe the regulations of centrally organized and/or scheduled examinations. This document also states the responsibilities of all stakeholders involved in these examinations.

For Bachelor's final projects and Graduation projects the main measures taken are stated in the regulations of the examination committee.

#### 6.3.1 Reliable

The assessment makes a meaningful distinction between the students who easily meet the learning objectives, and those who do not. Reliability is linked to the extent to which the assessment represents a consistent measurement. According to traditional test theory, the measurement-related correctness or reliability of an assessment can be interpreted in two ways:

- 1) the extent to which conformity is achieved between assessors.
- 2) the extent to which the scores achieved are consistent for a repeated measurement involving the same assessor.

The table below provides an overview of the tools and policy that M&CS use to ensure the reliability of assessment.



Table 3: Tools and policy on the measurement of the reliability of assessment.

	Tool	By whom	Policy at M&CS
Before	Peer assessment	Verifying colleague	A review of a final written test or final assignment by at least one peer is compulsory. Teacher Support asks for the verifying colleague during the intake meetings they have with lecturers.
	Answer model	Examiner	For open questions a grading scheme must be present that has been approved in advance by peers and that is used to grade the assessment. The Examination Committee monitors this procedure. In case of a report, presentation or other artefact, the examiner can use a rubric.
	Consultation between assessors	Lecturer team	Where there are several assessors, the examiner will be responsible for ensuring the uniformity of assessment. They will achieve this by providing answer models that feature a sufficient amount of detail, on the basis of consultation between the assessors, by dividing the questions to grade and/or by means of other suitable resources. When requested to do so, the examiner must be able to indicate how this uniformity is achieved.
After	Analyze assessment	Examiner/Exam expert	Where prompted by results or evaluations, this tool can be brought into use at the request of the examiner, Program Director or the Examination Committee. Digital grading platforms have this built into the system. The examiner can compare the average score of each grader on a question if multiple graders grade the same question.

### 6.3.2 Valid

Assessment questions must be valid, the content, level and good representation of the subject matter are key aspects of validity. The table below contains an overview of the tools that can be used when measuring the representativeness (content-validity) of assessment. The table also shows departmental policy on these tools.

Table 4: Tools and policy relating to the measurement of the content-validity of exam questions.

	Tool	By whom	Policy at M&CS
Before	The preparation of an assessment matrix.	Examiner	This tool is encouraged as an aid but not compulsory.
	Peer assessment	Verifying colleague	A review by at least one peer is compulsory to check the exam with respect to correctness, clarity, difficulty and learning outcomes of the course. Teacher Support asks for the verifying colleague during the intake meetings they have with lecturers.
After	Analysis of assessment questions on the basis of results.	Examiner/ Exam expert/ Quality assurance Officer	Central and departmental support can be obtained for assessment analysis.
	Student satisfaction surveys, feedback from course feedback sessions, program committees, the education officer from the study association.	Quality Assurance Officer, Program Committee, Evaluation Committee, students	The feedback moments ensure that any complaints about representativeness come to the attention of the Program and Examination Committees. These committees may ask Program Directors to put effective im-

		provement measures in place. The Examination Committee receives complaints from students; these are dealt with by the Examination Committee itself or via Program Directors.
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### 6.3.3 Transparent

**Transparency** in the context of assessment relates to the procedures and processes in place. These processes and procedures must be easily accessible to students. Students must be able to familiarize themselves properly with both and students should know how they are being tested, on what subject matter in advance. **Error! Reference source not found.** provides an overview of the tools that can be used when ensuring the quality of exam administration; policy on these tools is specified too.

Table 5 Tools and policy relating to the measurement of transparency of assessment.

	Tool	By whom	Policy at M&CS
Before	Mandatory final written test instruction.	Examiner	Every final written test has a cover page which states the examination instructions for students and proctors.
	Clarity is provided about grade composition in study guides.	Examiner	Mandatory
	Practice final written tests are provided	Examiner	In the Bachelor College, Week 8 of each quarter is reserved for exam preparation (lecturers do not deliver any new education, but organize question hours and hand out practice exams, etc.). In the study guide, lecturers provide practice questions and make the answers to at least one final written test available.
	Evaluation criteria of the assignment	Examiner	The rubric of the final assignment is made available to students at the start of the assignment.
	Information about fraud prevention policy	Examiner/Department	Information (on cover sheet, for example) about what is permitted and what is not.
After	Inspection	Examiner/Student	Dates of inspection should be clear for the students and in accordance with the PER.
	Course evaluations, curriculum evaluations, feedback, success rates	Program Management, Program Committee, Quality Assurance Officer, Examination Committee, students	Evaluations are discussed with the Program Management; Summaries are sent to the Program Committee and Examination Committee. The Examination Committee receives complaints from students; these are dealt with by the Examination Committee itself or via Program Director.
	After each exam period, the manager ESA and the Examination Committee will receive a report on any irregularities that occurred during exams (based on reports from exam monitors).	ESA Exam Organization	If necessary, the examiner in question will be contacted via the Examination Committee or Program Director.

### 6.3.4 Efficient

There are two sides to efficiency: the amount of assessment moments, the spreading of deadlines etc. must be in proportion to the learning process. Efficiency also relates to the information obtained through testing is proportional to the examiner's time investment (test development and correction and test taking).

Table 6: Tools and policy on the measurement of the efficiency of assessment.

	Tool	By whom	Policy at M&CS
Before	Exam schedule	Program Coordinator	The schedule of the final written tests period is checked by Program Coordinator to make sure that final written tests are spread as much as possible over the exam weeks.
After	Student Satisfactory surveys, Course evaluations, curriculum evaluations, feedback, success rates	Program Committee, Evaluation Committee, Quality Assurance Officer, Examination Committee, students	Through course surveys, students give feedback about the study load within the course and quarter and whether the assessment methods used are appropriate.

## 7 Fraud Policy

A TU/e diploma is highly valuable. Students, society, and the labor market need to be able to trust the value of this diploma. TU/e is aware of this fact and therefore makes a continuous effort to safeguard this value. In addition to trusting the content of the degree, people also need to be able to trust that a TU/e degree was obtained honestly. The fraud policy of this department is based on the TU/e Educational Fraud Policy (TU/e Educational Fraud Policy, 2015) and the regulations of the Examination Committees.

Fraud is defined in the Model Regulations of the Examination committee (Model Regulations of the Examination Committee, 2020):

*Cheating in tests and in applications for exemptions and examinations comprises any action or failure to act on the part of a student that makes it partially or completely impossible for the examiner to form an accurate opinion of his or her knowledge, understanding and skills, and/or deliberate attempts on the part of a student to influence any part of the examination process for the purpose of influencing the results of the examination.*

Following the university policy, there are four ways to prevent or act on fraud:

**Informing:** The boundaries of what is permissible are communicated to the student in a clear manner by the university (see 7.1)

**Prevention:** Any situations conducive to fraud will be avoided by the university and its students (see 7.2).

**Detection:** The University will ensure that no cheating occurs during examinations (see 7.3).

**Imposing sanctions:** In the event of fraud, sanctions will be imposed on the offending students that, in light of the breach of trust, are appropriate to the type of fraud committed (see 7.4).

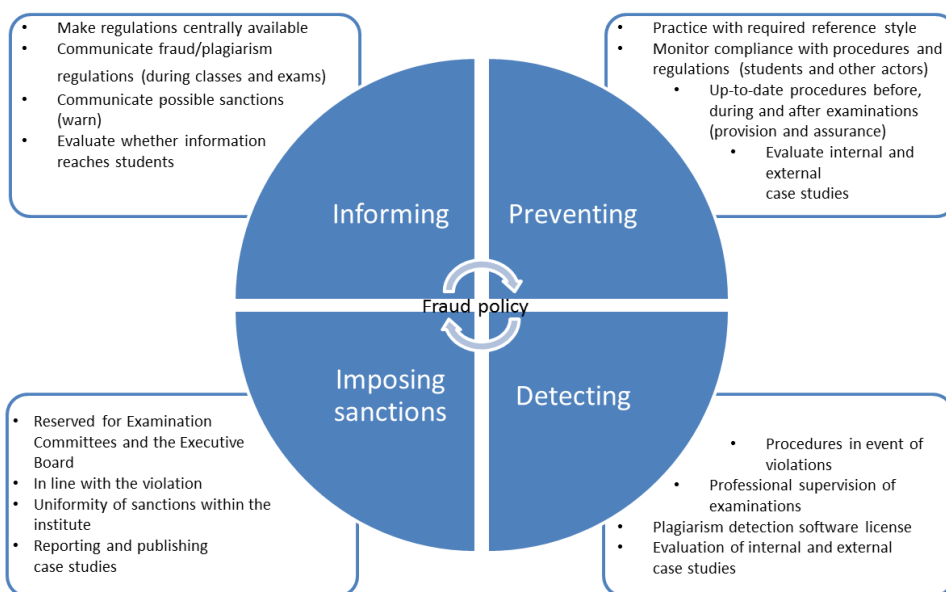


Figure 1 Overview of the TU/e Fraud Policy consisting of four elements (Van Meeuwen, 2014).

Fraud Policy is implemented at the Department in the following way:

## 7.1 Inform students about regulations and scientific integrity

All students of the M&CS (Bachelor and master) programs are informed about fraud during the kick-off meetings of year 1 quarter 1. The Program Coordinator of the program is responsible for providing this information.

During each written exam, students are informed which tools they may use, and which documents they may consult in case of open-ended exams. This information is included in the cover page of the written exam.

The Program and Examination Regulations of a program states when students are informed about the TU/e Code of Conduct for Scientific Integrity and when they must sign a formal declaration.

### 7.1.1 Inform staff about regulations

Lecturers are informed about the regulations in one of the UTQ module on assessment and this is also part of the on-boarding process for new lecturers. Changes in regulations are communicated to lecturers via standard departmental communication channels.

## 7.2 Prevent situations that provoke fraud

In addition to the standard fraud preventions measures, lecturers try to design online exams in such a way that answers cannot be looked up on the internet or be computed using online computation platforms. Exams typically have new questions every time and questions banks are hardly used.

### 7.2.1 Assessing assignments

With assignments, fraud usually happens in two different ways:

Texts are taken from the Internet without mentioning the source.

Texts are copied from other students.

In the latter case there is a fine line between student collaboration and copying texts. This lack of clarity is often enlarged if group assignments are given prior to the individual final assignment. Thus, it is essential to clearly communicate to students that this final assignment must be carried out individually. The final assignment must be formulated clearly along those lines, so that it can be assessed whether the student did indeed work independently on the final assignment.

### 7.2.2 Group assignments

For group assignments, cooperation with other students is intended and expected. In this case, lecturers must always provide students with transparent rules that specify under which circumstances collaboration and the joint submission of assignments is permitted. An important issue relevant to this type of assessments is social loafing, whereby some students put substantial less effort into the assignment than others. It is important that lecturers make clear to students how they can address this issue and how it will be handled.

### 7.2.3 Online assessment

For online assessment we can distinguish three main types of fraud:

**identity fraud:** the situation when another student takes the assessment.

**communication fraud:** the right student does the assessment but is in communication with others.

**reference fraud:** the student has access to material that is prohibited by the assessment.

In the next sections we describe the measures that can be taken to prevent fraud in online assessment. It is clear that for a final written examination that determines for 100% the grade of a course more measures should be taken than for assessment during the course that has primarily a formative function and contributes only to a limited extent to the final grade of the course.

For all three types of fraud proctoring or private monitoring is a measure that strongly increases conformance to the rules and any measure taken to detect fraud also work to prevent fraud because the likelihood of fraud being noticed increases.

#### *7.2.3.1 Identity fraud*

The measure that can be taken to prevent identity fraud is checking the identity of the student with their campus card, this is of course only possible in a proctored or monitored assessment. Another action when conducting oral examinations (where all students are asked individually to further explain some of their answers) or verification interviews (where a subset of students is asked to further explain some of their answers) additional to the proctored or non-proctored assessment.

#### *7.2.3.2 Communication fraud*

Communication fraud in online assessment can be prevented by, personalized sets of questions, personalized questions (e.g., same questions but different numbers), randomization of the order of the questions, and in case of multiple-choice questions also randomization of the answers. Limiting the time students can spend on questions (e.g., by preventing going back to previous questions) is a well-functioning measure that is not preferable (given the stress it causes students). Oral examinations or verification interviews can also be used to detect (and prevent) communication fraud.

#### *7.2.3.3 Reference fraud*

By conducting an open book assessment reference fraud can be prevented. Next to that oral examinations or verification interviews can be (to some extent) used to detect (and prevent) reference fraud.

### 7.3 Detection of fraud

The Regulations of the Examination Committee contain guidelines and instructions for content and procedural guidelines about examinations and final examinations.

Alertness is expected from the lecturers, examiners and exam monitors during an assessment. Lecturers are informed about how to act with fraud during assessments.

#### 7.3.1 Detecting plagiarism

Plagiarism is copying text of other sources without clear references to the right sources. Software to detect is available to lecturers to check whether assignments and other work have been published elsewhere inside or outside the university.

Every MSc thesis should be tested for plagiarism using designated software by or under responsibility of the thesis supervisor before handing in the thesis to the final project assessment committee. In cases where such a test is impossible for technical or confidentiality reasons, the supervisor has to check its authenticity. In cases of suspicion of fraud or plagiarism, the supervisor informs the Examination Committee (Guideline Graduate School 2020, 2020).

Bachelor's final projects have a smaller share in the study load of the Bachelor Program, but it is still strongly recommended to carry out a plagiarism check.

#### 7.4 Imposing sanctions

The Examination Committee imposes sanctions when fraud is detected. Sanctions should be similar for similar cases. Therefore, this topic is regularly addressed in the meetings of the Advisory Committee for Bachelor's Education (ACB) and Advisory Committee for Master's Education (ACM). The Examination Committee reports on the cases and sanctions in their annual report.

## 8 External Quality Assurance Processes

By Dutch law (WHW), our programs are regularly assessed (partly) by independent experts and student assessments (WHW Art. 1.18, paragraph 1 & 3). This is currently implemented by an institutional audit and a program audit.

The institutional audit (ITK) focusses on the robustness of the institutions' quality assurance systems and the associated procedures, and whether a sustained quality culture has been established within the institutions. In that case, a positive score on all the standards will confirm trust in the institution. Institutional audits do not qualify the quality of the programs. Institutions that have completed the institutional audit procedure with a positive or conditionally positive result may have their existing and new programs assessed under a so-called limited framework. When the limited framework is used, the panel is requested to avoid any overlap with the institutional audit.

In this chapter we describe how our internal quality assurance process is linked to the external quality assurance processes described above so that we can efficiently and successfully participate in external quality audits.

### 8.1 Link between internal quality assurance and external quality assurance

In the limited assessment framework, the four standards: Intended Learning Outcomes, Teaching-learning environment, Students Assessment, achieved learning outcomes are assessed (NVAO, 2018) The Program Director is responsible for the realization of the self-evaluation report in which these standards are assessed, which is then adopted by the Department Board. The Executive Board then formally applies to the NVAO for accreditation (TU/e Education Quality Assurance Framework, 2020) For the joint Bachelor Data Science, the procedure and responsibilities regarding the External Quality Assurance Processes are described in the Joint Agreement JADS. We discuss the four standards and how they link to the M&CS quality assurance processes in the next sections.

#### 8.1.1 Intended Learning Outcomes

Standard 1: *The intended learning outcomes tie in with the level and orientation of the program; they are geared to the expectations of the professional field, the discipline, and international requirements.*

*The intended learning outcomes demonstrably describe the level of the program (Associate Degree, Bachelor's, or Master's) as defined in the Dutch Qualifications Framework, as well as its orientation (professional or academic). In addition, they tie in with the regional, national, or international perspective of the requirements currently set by the professional field and the discipline regarding the contents of the program. Insofar as is applicable, the intended learning outcomes are in accordance with relevant legislation and regulations (NVAO, 2018).*

The Intended Learning Outcomes of every program are included in the PER (see 5.1.1.2). The Curriculum Committee (see 8.2) conducts a midterm review and checks the Intended Learning Outcomes and the curriculum. External experts will be consulted for advice on updates or changes in the ILOs or curriculum.

#### 8.1.2 Teaching-learning environment

Standard 2: *The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.*



*The intended learning outcomes have been adequately translated into educational objectives of (components of) the curriculum. The diversity of the students admitted is taken into account in this respect. The lecturers have sufficient expertise in terms of both subject matter and teaching methods to teach the curriculum and provide appropriate guidance. The teaching-learning environment encourages students to play an active role in the design of their own learning process (student-centered approach). If the program is taught in a language other than Dutch, the program must justify its choice. This also applies if the program bears a foreign language name. The teaching staff must have a sufficient command of the language in which they are teaching. Services and facilities are not assessed, unless they have been set up specifically for the program concerned (NVAO, 2018)*

The setup of the Bachelor College (TU/e Bachelor College Guideline, 2020) and Graduate School (Guideline Graduate School 2020, 2020) ensures a student-centered approach where students can design their own program. The link between the Intended Learning Outcomes and the courses are in the yearly updated Curriculum Design Document (see 5.1.1.2). The Annual Assessment Plan shows how different courses are assessed throughout the academic year (see 5.1.1.3). Newly hired staff is required to obtain their UTQ (see 5.5), additional to that there is the TEACH training program (see 5.5), the level of English is monitored (see 5.5) and excellent lecturers are rewarded (see 5.5.1).

### 8.1.3 Student assessment

Standard 3: *The program has an adequate system of student assessment in place.*

*The student assessments are valid, reliable and sufficiently independent. The requirements are transparent for the students. The quality of interim and final examinations is sufficiently safeguarded and meets the statutory quality standards. The tests support the students' own learning processes (NVAO, 2018).*

Examiners receive training on how to improve the quality of the assessment in a course in the UTQ Assessment module (see 5.5). The yearly updated Annual Assessment Plan (see 5.1.1.3) shows the way curriculum components are assessed and that assessment forms are well chosen and balanced. Additionally, the instruments to ensure reliability, validity, transparency and efficiency of assessments are described in chapter 6. The Bachelor College setup (TU/e Bachelor College Guideline, 2020) ensures that assessment is both summative and formative assessment is used. The Examination Committee has procedures in place (written down in their regulations) to safeguard the quality of assessment.

### 8.1.4 Achieved learning outcomes

Standard 4: *The program demonstrates that the intended learning outcomes are achieved.*

*The achievement of the intended learning outcomes is demonstrated by the results of tests, the final projects, and the performance of graduates in actual practice or in postgraduate programs. (NVAO, 2018)*

The Examination Committee has regulations and procedures in place to regularly check the quality of assessment of the Master and Bachelor's final project (Model Regulations of the Examination Committee, 2020). The Department cooperates with various partners from industry (part-time professors, external graduation projects and internships).

## 8.2 Midterm review

A revision of the program's intended learning outcomes is done three years after an accreditation or re-accreditation. For this, the Program Director will install a Curriculum Committee (CC) with a clear assignment.

This CC will consist of representatives of the program's different learning lines, clusters and one or more students. The CC will review the program's intended learning outcomes and check the connection between the intended learning outcomes at program level, at learning line level, and at course level. The CC will consider recent developments in the work field and other educational programs in the same domain, if applicable. In case of revision of the Intended Learning Outcomes or the curriculum the input of external advisors will be asked. The Curriculum Committee will advise the program management and the Department Board about improvements.

## 9 Appendices

### Roles and responsibilities

This appendix describes the stakeholders within the quality assurance cycle and their responsibilities within the process. A detailed description of formal departmental roles can be found in the departmental regulations.

Stakeholder	Responsibility related to quality assurance
Academic Advisor	The Academic Advisor shares any course quality-related signals received from students with the program coordinator.
Central Committee for Quality Care in Education (CCKO)	The CCKO ( <i>Centrale Commissie Kwaliteitszorg Onderwijs</i> ) is installed at TU/e central level and is responsible for the advancement of quality of education at TU/e. More specifically, it safeguards the quality of the major/minor structure, the Binding Study Recommendation, and the accreditation of programs. The CCKO coordinates and archives annual reports and it advises departments about issues related to quality assurance.
Cluster chair	The PD assigns courses and other teaching activities of his/her program to clusters rather than to individual lecturers. It is the responsibility of the cluster chair to divide the duties among the members of the cluster. The cluster chair should engage in consultation with the program directors with regard to the education provided by the staff members of the cluster. Note that a cluster may get teaching assigned from more than one PD and that a cluster may ask for assistance in a teaching assignment from other clusters. However, in principle, every teaching activity has only one main responsible cluster.
Deans Bachelor College and Graduate School	The Deans of the Bachelor College and Graduate School are responsible that all programs adhere to the TU/e educational quality assurance policy. They check the quality assurance of each program with the PD's. The Deans are responsible for ensuring quality, innovation, and improvements of the Bachelor College and Graduate School.
Department Board	The Department Board is responsible for the quality of education and for the Bachelor's and Master's programs offered by the department. The responsibility for the quality assurance of program-specific components lies primarily with the relevant department at TU/e, with the respective Dean being ultimately responsible (WHW Art. 9.14).
Department Council	The Department Council consists of staff and student representatives. The task of the Department Council is to advise the Department Board and check all decisions with impact on a significant part of the department. The Department Council has the right of consent on part of the Program and Examination Regulations and the department regulations.
Departmental Manager Education and Student Affairs	The departmental manager ESA is responsible for the setup and execution of quality assurance at all levels.
Deputy Program Director	Every program has a deputy PD; the responsible PD can mandate tasks to the deputy PD.
Examination Committee (EC)	The Examination Committee determines objectively and expertly whether a student meets the conditions, laid down in the examination regulations, in regard to knowledge, insight and skills that are necessary for obtaining a degree. The Examination Committee has the following tasks and responsibilities: Guaranteeing the quality of the exams and examinations; Establishing guidelines and instructions within the framework of the education and examination regulations, to assess and determine the results of examinations; Granting a student to follow a program com-

	posed by that student, of which the examination leads to a degree; Granting an exemption for taking one or more examinations; Guaranteeing the quality of the organization and the procedures regarding exams.
Policy Advisor Education	The Policy Advisor Education is responsible for the process of creating the annual report, the curriculum design document, and the assessment plan.
Program Committee (PC)	Each PC consists of both lecturers and student members involved in the program. The Program Committee provides advice on safeguarding and improving the quality of the program, including the PER. The PC advises the PD and the Department Board about any educational matters related to the study program. The PC has the right of consent on specific parts of the PER, for instance on the Intended Learning Outcomes of the program.
Program Coordinator	<p>The Program Coordinator provides operational and strategic support to the Program Director in ensuring the quality of the educational programs. In addition, the Program Coordinator is responsible for communicating to students about the program; this includes informing the students about regulations on fraud and plagiarism and informing the students of improvements in courses and the program.</p> <p>The Program Coordinator updates the curriculum design document and the assessment plan. Furthermore, the Program Coordinator gathers data for the annual report, under the responsibility of the Program Director and with the Policy Advisor as the process responsible.</p> <p>Moreover, the program coordinator follow-ups improvements at each QA level, collaborating with the quality assurance officer.</p> <p>The Program Coordinator takes important issues from Program Management meetings of the Program Management meetings to learning line review sessions.</p> <p>The Program Coordinator is responsible for organizing the review session with other Departments for service education courses.</p>
Program Director (PD)	<p>Each program has a PD, who has the final responsibility for the design and the execution of the program (as described in the Program and Examination Regulations and the curriculum design document) and all processes necessary to keep the program on track, including evaluations. The Program Director is responsible for evaluating the curriculum and the program as a whole and is accountable for the quality of education to the Dean BC or Dean GS and the Department Board. The PD is also responsible for the program accreditation visit, which takes place every 6 years.</p> <p>It is the responsibility of the PD to oversee and assure the quality of the program by acting from signals received from the quality assurance reports (among others) and implementing improvement plans.</p>
Quality Assurance Officer	<p>The Quality Assurance Officer (QAO) is responsible for overseeing the Quality assurance processes, analyzing and reporting the main outcomes from the quality assurance instruments, measurements and improvements to the Program Management . In addition, the QAO is responsible for updating the QA processes within the current policy and connecting and aligning information related to our education quality with Teacher Support and Academic Advisors.</p> <p>Finally, the QAO translates the QA TU/e central policies into our departmental working approach, proposes improvements for the M&amp;CS quality management system, and contributes to external quality assurance processes (accreditation) when necessary.</p>
Students	Students can contribute to improving education quality by providing constructive feedback through various channels, such as round table discussions, surveys, or informal meetings with teaching staff. They are encouraged to become members of the Program Committee. Also, the study association GEWIS (for mathematics and computer science) and D.S.A. Pattern (for data science) participate in quality assurance processes by organizing feedback sessions.
Teacher Support Officer	The teacher Support Officer and the Course Support Team provide support for course improvement to teaching staff.

Teaching staff

Teachers are responsible for delivering, maintaining, and improving course quality. They can use the QA instruments described within the current document. Additionally, the teaching staff has representatives in the Program Committee, the Examination Committee, and the Department Council, where the curricula, courses, and impact on workload may be discussed.

## Evaluation Plan Template

Use this format to write an evaluation for your course.

Why – What is the aim of the evaluation?	
What – What aspects do you want to evaluate? With which instruments? And who are the respondents?	Aspects Instruments Respondents
Who – Who is responsible for what?	Defining evaluation criteria Distribution Data analysis Reporting results Making changes Monitoring changes
When – When do you want to evaluate?	Before During After
How – How do you want to evaluate?	
How do you communicate it to your students?	

*UTQ module Evaluation – HRM/TEACH TU/e – teach@tue.nl*

## List of evaluation tools

Evaluation tool	Face-to-face ('offline')	Digital ('online')
<b>Peer evaluation</b>		
Observation of lectures	Lecturer asks a colleague, ESA teacher supporter, or TEACH trainer to observe a lecture [optional: fill in form]	The lecturer records the lecture and asks a colleague, ESA teacher supporter, or TEACH trainer to observe a lecture
Formal (e.g., interviews) or informal conversations with involved teaching staff and management (program director)	The lecturer has a conversation with colleagues or management ESA Teacher Support interviews lecturers	Evaluation form used by ESA Teacher support on process
Peer evaluation of the design of the course (study guide, course materials, assessment)		
<b>Student evaluation</b>		
Student panel or focus groups	The study association organizes a student panel The lecturer organizes a student panel (supported by ESA TS&QA)	The lecturer sets up an online discussion with voice and chat functionality
Informal talks	Lecturer asks students during the break	The lecturer sets up a poll through online tools (e.g., Mentimeter)
Analysis of assessment data		Assessment analysis Cirrus, ANS Delft
Questions/surveys for students	<i>During:</i> The lecturer plans a Handwritten questionnaire (e.g., 1-minute paper, muddiest point)	<i>During:</i> The lecturer organizes a survey using, for example, Canvas Quizzes, Mentimeter, FeedbackFruits or Evalytics
		<i>After:</i> The lecturer proposes to add tailor-made questions to the standard quarterly student satisfaction survey. (a limit number of questions can be added) The lecturer can also use: Canvas Quizzes, Microsoft forms, Socrative and Polleverywhere.
<b>Self-evaluation</b>		
Analysis of website or Canvas log files (learning analytics)		Not available yet
<p><u>Teaching Perspectives Inventory (links to an external site)</u> The Teaching Perspectives Inventory can help to collect thoughts and summarize ideas about teaching. It can be useful in examining your own teaching as well as helping clarify the teaching views of other people.</p> <p><u>Questions for self-appraisal (links to an external site.)</u></p> <p><u>Self-Evaluation Inventory (links to an external site.)</u> This tool assists you to evaluate your teaching practices in accordance with the principles laid out in <u>Good Practices in Undergraduate Education (links to an external site)</u> .</p>		

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## Teacher feedback form

1. Please provide your feedback to students on the course evaluation results
2. Are you satisfied with the course evaluation results in general?
3. Do you recognize any of the remarks stated by the students? Please explain. (e.g., remarks with compliments or points for improvement)
4. Did you encounter any bottlenecks teaching your course? Please specify.
5. Are you satisfied with the exam format of your course? Are the TUE options suitable for your examination needs? Please elaborate
6. What do you plan to change or improve for next year? (leave empty if there are no changes)
7. Do you have any additional comments, questions, compliments, or concerns you would like to share?



### Standard Course Evaluation Surveys

Harmonized student satisfaction surveys (adopted in the Education Board) are used. Each department has the option to expand the survey with a maximum of ten additional questions.

#### Format 1 (Short survey)

Overall, how would you describe the level of difficulty in this course?

On a scale of 1 to 10, how would you rate this course/project (with 10 being “excellent”)?

The educational setup (e.g. structure, content, teaching/learning methods, level, and coherence) worked well and was suitable for this course.

The course was well organized (e.g. availability of lecturers/supervisors, availability of information, scheduling, and planning).

The course material was clear and motivated me to study for this course.

The assessment of this course was appropriate (e.g., methods used, relevance and clarity of the questions/assignments)

The effort I applied to complete this course corresponds with the number of credits (5 ECTS = 140 hours).

What percentage of the teaching sessions did you attend?

The lecturer explained the content in a clear and comprehensive way

The instructor/tutor helped me master the subjects.

The supervisor helped me master the subjects.

What did you like about this course?

What would you improve in this course?

Responsible teachers can add 10 course specific questions at the beginning of the quarter (questions from formats 1a, b, c, d will count as additional questions)

#### Format 2 (Extended survey)

1. Overall, how would you describe the level of difficulty in this course?
2. On a scale of 1 to 10, how would you rate this course (with 10 being “excellent”)?
3. How relevant was this course for your study program?
4. Did you have sufficient prior knowledge and/or skills to follow this course?
5. If your answer above was no, please explain:
6. The educational setup (e.g. structure, content, teaching/learning methods, level, and coherence) worked well and was suitable for this course.
7. The course was well organized (e.g. availability of lecturers/supervisors, availability of information, scheduling, and planning).
8. The course material was clear and motivated me to study for this course.
9. The effort I applied to complete this course corresponds with the number of credits (5 ECTS = 140 hours).
10. How many hours did you spend on this course in total? Note that 1 ECTS is equal to 28 hours of work.  
Lectures:
11. The lectures were clear and effective.  
Tutorials:

12. This educational form contributed to my understanding of the subject matter.
13. There were sufficient opportunities to ask questions.
14. The feedback I received was sufficient and useful.

Instructions:

15. This educational form contributed to my understanding of the subject matter.
16. There were sufficient opportunities to ask questions and work on exercises
17. The exercises to practice at exam level were relevant.

Assessment:

18. The assessment of this course was appropriate (e.g., methods used, relevance and clarity of the questions/assignments)
19. This interim test (e.g. clarity of questions/assignment, level, etc.) provided clear feedback on my progress in this course.
20. The final test of this course was appropriate (e.g., methods used, time to finish, relevance and clarity of the questions/assignments).
21. The final test accurately represented the subject matter.

Professional skills:

22. The assessment of this professional skill was clear. (e.g. assessment methods, representation of the assignment, criteria, etc.).
23. The feedback I received helped me to develop this professional skill.
24. This course/assignment helped me to improve this professional skill.

Educator(s):

25. The lecturer explained the content in a clear and comprehensive way
26. The lecturer used the available media (e.g. blackboard, powerpoint) appropriately and clearly.
27. This lecturer motivated me (e.g., content, interaction, use and variation of teaching methods).
28. The instructor/tutor helped me master the subjects.
29. The instructor/tutor was approachable and open to questions.
30. The supervisor explained the subject in a clear and comprehensive way.
31. The supervisor was approachable and open to questions.

Open questions:

32. What did you like about this course?
33. What would you improve in this course?

### Format 3 (Survey for Project based courses)

Overall, how would you describe the level of difficulty in this project?

On a scale of 1 to 10, how would you rate this course/project (with 10 being "excellent")?

How relevant was this project for your study program?

Did you have sufficient prior knowledge and/or skills to follow this project?

If your answer above was no, please explain:

This educational setup (e.g. structure, content, teaching/learning methods, level, and coherence) worked well and was suitable for this project.

This project was well organized (e.g. availability of lecturers/supervisors, availability of information, scheduling, and planning).

The project description was clear and motivated me to work on this project.

The effort I applied to complete this project/course corresponds with the number of credits (5 ECTS = 140 hours).

How many hours did you spend on this project/course in total? Note that 1 ECTS is equal to 28 hours of work.

Lectures:

The lectures were clear and effective.

Tutorials:

This educational form contributed to my understanding of the subject matter.

There were sufficient opportunities to ask questions.

The feedback I received was sufficient and useful.

Instructions:

This educational form contributed to my understanding of the subject matter.

There were sufficient opportunities to ask questions and work on exercises

Educators:

The lecturer explained the content in a clear and comprehensive way

This lecturer's presentation motivated me (e.g. content, interaction, use and variation of teaching methods).

I received sufficient support from the instructor/tutor during this project.

The instructor/tutor was approachable and open to questions.

I received sufficient support from this supervisor during this project.

The supervisor was approachable and open to questions.

Assessment:

The assessment as a whole was appropriate (e.g., methods used, relevance and clarity of the assignments).

The assessment criteria were clear.

The interim test provided sufficient feedback to improve my work by the end of the project.

This assessment component (interim test) was clear, relevant and representative.

This assessment component (final test) was clear, relevant and representative.

Professional skills

The assessment of this professional skill was clear. (e.g. assessment methods, representation of the assignment, criteria, etc.).

The feedback I received helped me to develop this professional skill.

This project helped me to improve this professional skill.

Open questions:

What did you like about this project/course?

What would you improve in this project/course?

Appendix F Annual Educational Evaluation Overview

Annual Educational Evaluation Overview (program and course) within the Program Management

Survey	Q1	Q2	Q3	Q4	Guests: student member and staff member of PC
<b>Course evaluation</b>	Discuss Q4	Discuss Q1	Discuss Q2	Discuss Q3	x
<b>End of the Year</b>	x	x			x
<b>Bachelor final Project</b>	x				x
<b>Internships</b>	x				x
<b>Graduation project</b>	x				x
<b>Transfer survey</b>			x		x
<b>NSE</b>	x				x

Appendix G Process of curriculum changes

Owner of this document: Sandra Bruin, policy offer M&CS

Established 06-05-2021 in Education Management Team Strategic.

	What	when	who	com-ments
1	<p>submit any suggested changes for AY starting 12 months later. This includes:</p> <ul style="list-style-type: none"> <li>• Change of course code</li> <li>• Change of timeslot</li> <li>• Change of exam format</li> <li>• Change of learning goals</li> <li>• Change of target group</li> <li>• New courses</li> <li>• Courses to be canceled.</li> <li>• Caps/limitations in student groups/programs who can take the course</li> <li>• Prerequisite knowledge</li> <li>• Level change (bachelor)</li> </ul>	31st August	<p>Anyone: Cluster, also teachers but they may have a shorter term vision.</p> <p>Main focus is to ask the cluster management to point out that they are the owner of the course, not an individual teachers.</p>	To program coordinator; message from program director/program coordinator to cluster leaders to remind them
2	<p>all information to Program Director</p> <p>In PER tables and in curriculum excel formats (Paul Verkooijen).</p>	September	Program coordinator	Total overview Note: fill out also tab 2, changes in curriculum
3	Discuss changes in the Domain management Meeting.	October	Program director	Changes may affect required capacity.
4	discuss new courses/trajectories in Curriculum Committee if and when appropriate	October	Program director; prepared by program coordinator.	ap-proves/gives feedback.
5	full program is discussed in Program Committee.	November	Program director; prepared by program coordinator.	ap-proves/gives feedback.

Quality Assurance and Assessment Policy

6	In case of level changes, discuss level changes with Examination Committee	December	Program director; prepared by program coordinator.	approves
7	full program is discussed in Department Board including transition arrangements.		Policy officer	Intention to establish
8	full program is discussed in Program Committee including transition arrangements.	December	Program director; prepared by program coordinator.	approves
9	full program is discussed in Department Council including transition arrangements.	January	Policy officer	approves
10	full program is discussed in Department Board including transition arrangements.	January	Policy officer	establishes
11	program for next AY is <b>established</b> and draft program for next cohort.	<b>Feb 1st</b>	Program director	Communicated to Course Catalogue M&CS (Paul Verkooijen) and the dept. Board.
12	Communication to students/PER/Program Guide – 3-year horizon	1 April	Program coordinator together with AA.	All changes are open to students in OSIRIS as of 1 April; in the kick-off of Q4, students receive detailed information about curriculum changes
13	Curriculum tables as well as transition arrangements text (bi-lingual) are finalized in the PER format.	1 May	Program coordinator	
14	Exam programs entered in OSIRIS	July	Scheduler/key-user OSIRIS	
15	Students connected to exam programs	September	CSA	

## References

- Anderson, & Krathwohl. (n.d.). Retrieved from Bloom's Taxonomy Revised, Understanding the New Version of Bloom's Taxonomy: [https://quincycollege.edu/wp-content/uploads/Anderson-and-Krathwohl\\_Revised-Blooms-Taxonomy.pdf](https://quincycollege.edu/wp-content/uploads/Anderson-and-Krathwohl_Revised-Blooms-Taxonomy.pdf)
- Bestuur van de Faculteit Wiskunde en Informatica. (2020). *Faculteitsreglement*. Retrieved from [https://intranet.tue.nl/\\_assets/fileadmin/content/Faculteiten/WSKI/Nieuws/2019/WI%20Faculteitsreglement%20June2020.pdf](https://intranet.tue.nl/_assets/fileadmin/content/Faculteiten/WSKI/Nieuws/2019/WI%20Faculteitsreglement%20June2020.pdf)
- Bologna Follow-Up Group. (2005). *Framework for Qualifications of the European Higher Education Area*.
- de Haan, D., van de Watering, G., & van Meeuwen, L. (2019). *TU/e Exam Framework*. Retrieved from [https://assets.studiegids.tue.nl/fileadmin/content/centrale\\_content/Studeren/2019-05-23-TUe\\_Exam\\_Framework\\_2019\\_final\\_ENG.pdf](https://assets.studiegids.tue.nl/fileadmin/content/centrale_content/Studeren/2019-05-23-TUe_Exam_Framework_2019_final_ENG.pdf)
- Departmental Regulations*. (2022, March 31). Retrieved from [https://intranet.tue.nl/\\_assets/fileadmin/content/Faculteiten/WSKI/Nieuws/2022/MCS%20Department%20Regulations\\_March2022.pdf](https://intranet.tue.nl/_assets/fileadmin/content/Faculteiten/WSKI/Nieuws/2022/MCS%20Department%20Regulations_March2022.pdf)
- Dutch Qualification Framework (NLQF)*. (n.d.). Retrieved from <https://www.nlqf.nl/english>
- Eindhoven University of Technology. (2019). [https://assets.studiegids.tue.nl/fileadmin/content/centrale\\_content/Studeren/Toetsing/Central%20Examination%20Regulations.pdf](https://assets.studiegids.tue.nl/fileadmin/content/centrale_content/Studeren/Toetsing/Central%20Examination%20Regulations.pdf). Retrieved from TU/e Central Examinations Regulations.
- Executive Board of Eindhoven University of Technology. (2020). *TU/e Bachelor College Guideline*. Retrieved from [https://assets.studiegids.tue.nl/fileadmin/content/centrale\\_content/Organisatie/Regelingen/Richtlijn%20BC%202020%20ENG%20DEFINITIEF.pdf](https://assets.studiegids.tue.nl/fileadmin/content/centrale_content/Organisatie/Regelingen/Richtlijn%20BC%202020%20ENG%20DEFINITIEF.pdf)
- Executive Board of the Eindhoven University of Technology. (2020). *Guideline Graduate School 2020*. Retrieved from <https://educationguide.tue.nl/organization/regulations-codes-of-conduct-and-guidelines/regulations-and-guidelines/>
- Havekes, E., & van de Watering, G. (2020). *TU/e Education Quality Assurance Framework*. Retrieved from [https://intranet.tue.nl/\\_assets/fileadmin/content/Diensten/STU/TUe\\_Education\\_Quality\\_Assurance\\_Framework\\_1884685.pdf](https://intranet.tue.nl/_assets/fileadmin/content/Diensten/STU/TUe_Education_Quality_Assurance_Framework_1884685.pdf)
- Koelink, E., Kranenburg, M., & Kraaikamp, C. (2017). *Evaluatie Mastermath*. Retrieved from [https://elo.mastermath.nl/pluginfile.php/220/mod\\_page/content/27/170623%20-%20Definitief%20rapport%20evaluatie%20Mastermath.pdf](https://elo.mastermath.nl/pluginfile.php/220/mod_page/content/27/170623%20-%20Definitief%20rapport%20evaluatie%20Mastermath.pdf)
- Meijers, A., Overveld, C. v., & Perrenet, J. (2005). *Criteria for Academic Bachelor' and Master's Curricula. Model Regulations of the Examination Committee*. (2020). Retrieved from [https://assets.studiegids.tue.nl/fileadmin/content/centrale\\_content/Organisatie/Regelingen/Regulations%20of%20the%20examination%20committee%202020-2021.pdf](https://assets.studiegids.tue.nl/fileadmin/content/centrale_content/Organisatie/Regelingen/Regulations%20of%20the%20examination%20committee%202020-2021.pdf)
- NVAO. (2018). *Assessment framework for the higher education accreditation system of the Netherlands*. Retrieved from

[https://www.nvao.net/files/attachments/.139/Assessment\\_Framework\\_for\\_the\\_Higher\\_Education\\_Accreditation\\_System\\_of\\_the\\_Netherlands\\_2018.pdf](https://www.nvao.net/files/attachments/.139/Assessment_Framework_for_the_Higher_Education_Accreditation_System_of_the_Netherlands_2018.pdf)

*TU/e Central Examination Regulations.* (2019). Retrieved from [https://assets.studiegids.tue.nl/fileadmin/content/centrale\\_content/Studeren/Toetsing/Central%20Examination%20Regulations.pdf](https://assets.studiegids.tue.nl/fileadmin/content/centrale_content/Studeren/Toetsing/Central%20Examination%20Regulations.pdf)

van Meeuwen, L., & Kraak, T. (2015). *TU/e Educational Fraud Policy.* Retrieved from [https://assets.studiegids.tue.nl/fileadmin/content/centrale\\_content/STU\\_files/Toetsen\\_en\\_fraude/150409\\_TUeEducationFraudPolicy\\_def\\_version\\_1\\_1.pdf](https://assets.studiegids.tue.nl/fileadmin/content/centrale_content/STU_files/Toetsen_en_fraude/150409_TUeEducationFraudPolicy_def_version_1_1.pdf)

*Wet op het hoger onderwijs en wetenschappelijk onderzoek.* (n.d.). Retrieved from <https://wetten.overheid.nl/BWBR0005682/2022-01-01/0>.