Quality Assurance Plan of the department of Electrical Engineering

Academic year 2023-2024

Applies to:

- Bachelor of Electrical Engineering (major Electrical Engineering and major Automotive Technology)
- Master of Electrical Engineering
- Master of Artificial Intelligence & Engineering Systems

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Dr. Els van Rooij
Quality Assurance Officer Electrical Engineering
Quality.Assurance.EE@tue.nl

Contents

1. Introduction

The TU/e Education Quality Assurance Framework outlines the quality assurance system and the joint agreements and preconditions that departmental quality assurance must meet. The Quality Assurance Plan of the department of Electrical Engineering (EE) describes how the quality of education is guaranteed and how the education improvement cycle is closed (1) at the level of all individual courses offered by the department of EE and (2) for the study programs within EE as a whole, i.e. the Bachelor's program Electrical Engineering (the major Electrical Engineering and the major Automotive Technology (AT)), the Master's program Electrical Engineering and the Master's program Artificial Intelligence & Engineering Systems (AI&ES). The latter program is an interdepartmental program. It is offered as a joint co-operation between seven TU/e departments: EE, Mechanical Engineering, Applied Physics, Mathematics and Computer Science, Biomedical Engineering, the Built Environment, and Industrial Engineering & Innovation Sciences. EE is the leading department. As such, the quality assurance of the program AI&ES is the responsibility of EE.

The TU/e vision on quality assurance, the TU/e-wide procedures, instruments, and regulations are already described in the TU/e Education Quality Assurance Framework, so this EE Quality Assurance Plan has a strong practical focus by specifying the actions that different actors in the department take to guarantee high quality EE education.

The EE Quality Assurance Plan will be updated every year and is included in the Program and Examination Regulations (PER) of each program. Compared to 2022-2023, the following changes have been made:

- We do not as a default evaluate *all* courses anymore (see paragraph 2.1).
- We will increase our focus on the pre-master programs EE and AI&ES by also making quarter overviews for these programs and discussing these (see paragraph 2.1).
- Exams of year-1 BC BR (before revision) courses that are taken by ≥50 students will be evaluated with a brief survey (see paragraph 2.2).
- The template for writing a program improvement plan (an improvement plan on a program level, i.e. for issues that transcend individual courses) has been removed, as it was never used in the previous two years.

2. Quality assurance of individual courses

2.1 Course evaluation at EE: course and quarter overviews

In line with the TU/e QA Framework, courses that have good evaluation results – at least an overall rating of 7 on a scale of 1 to 10 for the last three years – and have not had any major changes in teachers, educational methods, assessment, etc. will only be evaluated via the formal course survey once every three years. Also if a course has less than 15 registered students, we will not automatically evaluate the course with a formal survey. This is because the expected number of survey responses is so low that no conclusions can be drawn. In both of these cases where a course will not automatically evaluated, we will contact the responsible teacher and ask them if maybe they *do* want the course to be evaluated with the formal survey. If the teacher wants the course to be evaluated, e.g. because they need formal evaluation results for their UTQ, we will do so. For courses that will not be evaluated with the formal evaluation, we hope to receive information from StudentBody, with the main question: 'Is everything going OK?'. At the beginning of the quarter, the quality assurance officer will notify SB which courses will not be formally evaluated, so they can try to make sure that students who follow these courses are present at their council (although this might be difficult in the case of <15-students-courses). When the quarter has ended and students' results have come in, the quality assurance officer will

contact the responsible teachers of the courses that were not formally evaluated and ask them to provide some input on how the course went.

Course overview

At EE, we perceive course evaluation to be broader than just measuring students' satisfaction with the course by means of the course evaluation survey. Our (working) definition of course evaluation is: combining different types of input (at least the evaluation survey results, students' results (e.g. pass rate of the course), and input from the teacher) from different stakeholders (at least from students and the responsible teacher) in order to obtain an impression of the quality of a course.

These different types of input are:

1) Evaluation survey results: results of the course evaluation survey that is completed by students;
2) Students' results: pass rate and average grade of the final examination (first and second attempt) and the overall pass rate of the course after one attempt and after two attempts;
3) Teacher's input: input from the responsible teacher about how they experienced the course, their reflection on students' achievement and the course evaluation results, and their plans for the next run of the course;
4) Feedback gathered by StudentBody (SB) during their study councils that take place multiple times every quarter.

The different types of input listed above are combined into an overview of every course after the quarter that that course was given in. We will also make overviews of courses that were not evaluated with the survey; in that case only the evaluation survey results will be missing. Appendix A shows an example of such a course overview. This overview is sent to the responsible lecturer of the course and to the chair of the capacity group that offers the course.

Quarter overview

All course overviews of a specific quarter are combined into a quarter overview for each program, so after every quarter there are five quarter overviews: one for the bachelor EE, one for the pre-master EE, one for the pre-master AI&ES, one for the master EE, and one for the master AI&ES.

The quarter overview of the bachelor EE consists of all courses that are part of the major EE or AT and of all electives offered by the department of EE.

The quarter overview of the master EE consists of all master's courses offered by the department of EE and the three core courses offered by the department of Mathematics & Computer Science.

The quarter overview of the pre-master EE and that of the pre-master AI&ES consist of all pre-master courses of these programs.

The quarter overview of the master AI&ES consists of all core courses and the interdisciplinary team project. Additionally, the AI&ES quarter overview will contain a brief summary of the specialization courses, ordered by track. The summary will contain the overall rating in the course evaluation; the course pass rate after one attempt of all students who followed the course and of all AI&ES students who followed the course; if there may have been substantial issues with the course; an evaluation from the teacher; whether or not the course might be a point of attention for the PC or EC; and the number of AI&ES students who followed the course. It will also be shown if the course rating or pass rate are substantially higher or lower than they were the previous year. Table 1 shows an example of such a summary. In case 10 or more AI&ES students followed the course, the course overview of that course (with detailed information) will also be included. In this way, the program management of AI&ES as well as the Program Committee and Examination Committee of AI&ES are informed about how these courses are doing. The responsibility for the quality of those courses, however, belongs to the department that offers these specialization courses.

Table 1. Example of part of a summary of specialization courses

SPECIALIZATION COURSES							
Course	**Overall rating**	**Course pass rate of serious AI&ES students (all students)**	**Any substantial issues?**	**Teacher's evaluation?**	**Point of attention for PC or EC?**	***n* AI&ES students/total *n* students in course**	**Page**
Track 2: Mobility							
1CM110: Decision Making in Transport and Logistics	8.4	100% (96%)	No	Yes	No	6/58	-
5LSH0: Computer Vision and 3D Image Processing	7.5↓	100% (94%)	No	No	No	23/69	12
Track 5: AI foundations and Science Applications							
3MS020: Soft Matter Physics	6.7↓	NA (95%)	No	No	No	0/35	-
4SC000: Optimal Control and Reinforcement Learning	Not evaluated	67% (90%)	?	?	?	5/105	-
5LMA0: Model Reduction	8.4	80% (91%)	No	Yes	No	8/76	-

Grey: no AI&ES students took this course.

The course overviews consist of different types of data that have to be collected and are not all quickly available after the quarter has ended, due to grading terms, the evaluation survey being open for two weeks, and responsible lecturers having three weeks to reflect on the evaluation results and grades and to discuss this with their co-lecturers. Therefore, there is a possibility that it can take up to six weeks after the quarter until the overviews are ready. It is our goal to have processed and discussed courses of quarter *x* with the relevant stakeholders (e.g. the Program Director, Program Leaders and the Program Committee) before quarter *x*+2 starts.

2.2 Evaluation of transitional arrangements

Due to the introduction of the new bachelor curriculum in 2023-2024, the 'old' year-1 courses will not be taught anymore. Transitional arrangements are offered to students from the cohort 2022-2023 (and older cohorts) who have not yet passed these courses. The specifics of the arrangements differ per course, but all students have two extra exam possibilities in 2023-2024. For some courses, the number of students who still have to pass it is quite large. In courses where 50 or more students are taking the exam of an old course, we will evaluate the exam – and possible educational sessions that have been held to help students pass the course – with a brief survey. The goal of that survey is to assess the difficulty and validity of the exam and – if relevant – to check if the extra educational activities have sufficiently helped them to pass the course and if not, what they think they need in order to pass the course. This information may be important in case the pass rate of the first attempt of an old course is low or in case there are indications that there were possible issues with the exam. This survey will be sent out via Evalytics to all students enrolled for the exam.

2.3 Role of the Program Committees in course evaluation

The quarter overviews are shared with and discussed in the relevant Program Committee (i.e. the PC-EE will receive the overviews of the bachelor and master EE and the PC-AI&ES will receive the overview of the master AI&ES), who focuses specifically on the survey results and the responsible teacher's input and not so much on examination results and pass rates. The quarter overview starts with a summary of every course that shows students' overall rating of the course, the pass rate, whether the teacher has provided input, and whether the QA officer thinks this course might need specific attention from either the PC or the EC and, if so, why. Following the discussions in the PC, for every course, there are three possibilities:

1. Good → no action required

The PC concludes that the course overview looks good and that there is no need for any further action regarding this course. In case a course has very positive evaluation results or if a course has significantly improved compared to the previous year, the PC can send the responsible lecturer a letter of compliments, as a token of appreciation. To help the PC in this process, the QA Officer will already flag some courses that she thinks are candidates for the letter of compliments and she will assist the secretary of the PC in providing the necessary information to send the letters.

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

(a) The PC thinks there might be some issues in a course, but the data in the course overview are insufficient. 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 – on behalf of the PC – can gather more input, e.g. remind the teacher to complete the teacher's evaluation, 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 QA officer will report back to the PC, after which the PC will discuss if any further action is needed.

(b) The PC sees that there are some minor issues with a course, but they do not think further action is necessary (at this point). Examples of this situation are: the course is new and there are some start-up problems; there were issues, but they were clearly caused by an external factor that will likely not be present in the next year (e.g. 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 QA officer makes a note of this, so that next year it can be checked if the minor issues have been resolved.

In case of minor issues, a teacher's evaluation is extremely helpful, so if the responsible teacher has not provided one, a reminder will be sent by the QA officer.

3. Major issues → improvement plan required

The PC has serious worries about a course. The PC shares these worries, either directly in the PC-EE meeting or via e-mail, with the Program Director (PD) and Program Leader (PL). They can advise the PD to ask the responsible lecturer to write an improvement plan. It is up to the PL to take action and ask for the plan, if the PD and PL deem this necessary. The PD and PL will keep the PC-EE informed about what happens next.

2.4 Role of the Examination Committees in course evaluation

The quarter overviews are shared with and discussed in the relevant Examination Committee (i.e. the EC-EE will receive the overviews of the bachelor and master EE and the EC-AI&ES will receive the overview of the master AI&ES), who focuses on the quality of assessment and on students' results (results of the final exam and the pass rates). The quarter overview starts with a summary of every course that shows students' overall rating of the course, the pass rate, whether the teacher has provided input, and whether the QA officer thinks this course might need specific attention from either the PC or the EC and, if so, why. Following the discussions in the EC, for every course, there are three possibilities:

1. Good → no action required

The EC concludes that the course overview looks good and that there is no need for any further action.

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

a) The EC thinks there might be some issues in a course, but the data in the course overview are insufficient. The EC, or the QA Officer on behalf of the EC, will contact the teacher for more information.

b) The EC sees that there are some minor issues with the examination or pass rate of a course, but they do not think further action is necessary (at this point). Examples of this situation are: the course is new, so the teachers struggled to determine an adequate difficulty level of the exam or there was not sufficient exam practice material yet for the students; there were issues, but they were clearly caused by an external factor that will likely not be present in the next year (e.g. an online exam going wrong); the teacher's evaluation includes a plausible reason for a deviating pass rate and a plan to address this next year. The QA officer makes a note of this, so that next year it can be checked if the minor issues have been resolved.

In case of minor issues, a teacher's evaluation is extremely helpful, so if the responsible teacher has not provided one, a reminder will be sent.

3. Major issues → improvement plan required

The EC has serious worries about the quality of the examination or the pass rate of a course (e.g. extremely low or very high). In that case, the EC can conduct an investigation. They can do this by asking the Assessment Committee, a subcommittee of the EC, for a test analysis (see paragraph 2.11 Test analysis) or for conducting the investigation in another way. Depending on the possible place of the course in multiple curricula of programs of different departments, multiple EC's may have to be involved in this process. The results of the investigation by the Assessment Committee will be discussed with the EC and with the responsible lecturer. If deemed necessary, the responsible teacher can be asked to write an improvement plan based on the issues identified in the investigation. The Program Director and Program Leaders are closely involved in this process, as they are ultimately responsible for the quality of assessment.

2.5 Note regarding quality assurance of courses that are part of multiple programs

Some courses are part of programs offered by different departments, e.g. master's courses that are a mandatory part of a master's program in one department and a specialization or track elective of a program in another department. If there appear to be issues with such a course, it is the responsibility of the offering department to take the necessary actions, as that course falls under the quality assurance cycle of that department. In case there are worries at EE about a course offered by another department, the QA officer of EE will check with the QA officer of the offering department if any actions are being taken. In case there appear to be AI&ES-specific issues with a course offered by another department – e.g. AI&ES students not having sufficient prior knowledge to successfully follow the course – the AI&ES Program Leader will set up a meeting with the responsible lecturer of the course to discuss the issue.

2.6 Note regarding the role of the responsible lecturers in quality assurance

The processes above describe that if a PC or EC has concerns regarding a course, they (or the QA officer, on behalf of them) will contact the responsible lecturer for further information, for an open conversation about the course, or to ask if they are willing to provide certain documents (e.g. in case of a test analysis). It is important to note that such questions have the goal to improve education and assessment at EE together. The responsible lecturer can decide whether or not they also want to involve the co-lecturers in the process.

2.7 Importance of the historic perspective

Important to note is that the course overviews also include survey results and pass rates from the previous two academic years, so that the results can always be put in perspective. If there is no clear explanation for substantial differences between the current pass rate and evaluation survey results and those from previous years (e.g. complete change of teacher team, entirely new set-up), this can be investigated further.

2.8 Courses with low pass rates

Courses that have a low pass rate will be monitored and evaluated extra carefully. If the course needs specific attention, the PL, representatives of the PC or EC, and – if desired – the quality assurance officer and/or teacher supporter, can talk with the responsible teacher to together understand the issues and look for ways to improve the quality of the course. To obtain more insight into the specific bottlenecks of a course with low pass rates, a special set of questions can be added to the evaluation survey (see Appendix B).

2.9 Other stakeholders in the quality assurance cycle

The QA officer also always discusses the quarter overview with the PLs, the Teacher Supporters, and StudentBody (as student stakeholders).

The PD of the department of EE is ultimately responsible (mandated by the dean) for the quality of the education and assessment of our programs. The Program Director's core responsibility is to professionalize, to actualize and to make (or maintain) the curriculum and assessment program of each education program accreditation-worthy. In case serious problems arise from the course overview, a PD can always take immediate action (see also paragraph 2.12 The escalation ladder).

When discussing the course overview, the Teacher Supporters will specifically focus on teachers' needs for the next run of the course (e.g. educational or didactical support, extra TAs, specific resources, help in general).

The QA officer has frequent contact with the StudentBody and will meet with them at least once every quarter to discuss the course overviews of the previous quarter. The SB can, from the student perspective, note if there were serious issues students experienced with certain courses that are not yet mentioned in the course overview. If that is the case, this input will be added to the overview. For this reason, the meeting with SB will always take place before the course evaluation overview is discussed in the PC and EC. Furthermore, the QA officer attends the (almost) bi-weekly Panel of Education (PoE) meetings organized by the SB, in which they discuss the courses that are currently running.

All students of (programs offered by) the department of EE are crucial stakeholders in course evaluation. Therefore, the department strongly encourages responsible teachers to communicate to students what they think of the students' feedback in the course survey, what they think of the examination results of the course, and what they are planning to change in next year's edition of the course (if anything). Teachers can do this in the course evaluation system Evalytics that will be used in the academic year 2022-2023.

2.10 The course improvement plan

The PD (possibly on the advice of the PC) and the EC can request a course improvement plan from the responsible lecturer of a course. It is important that there is a clear follow-up *after* the course improvement plan has been written and discussed. The responsible lecturer is responsible for executing the proposed actions in the improvement plan, with help of the Teacher Supporters if needed. The QA officer is responsible for monitoring and evaluating the course improvements. Appendix C shows the course improvement plan process and Appendix D shows the course improvement plan template that teachers can use if they find this helpful.

Improving a course for the new academic year can require changing course contents, teaching methods, and/or assessment methods. Unless it concerns a Q1 course, this means that information in Osiris has to be changed after the official deadline for changes of February 1st. In case of an improvement plan, however, an exception can be made, so that changes in Osiris can also be made after the deadline of February 1st. In that case, however, the changes have to be approved by the so-called triangle of the PL, manager ESA and chair of the EC.

2.11 Test analysis

A test analysis can be requested from the QA officer in several cases:

1) An Examination Committee can request a test analysis, because they suspect that there may have been serious issues with the exam.
2) An Examination Committee can request a test analysis for one or several courses as a 'random' check of the quality of assessment in a program.
3) The responsible teacher of a course can ask for a test analysis because they want to know more about the examination *after* the results have been published to the students, e.g. to evaluate a new assessment method.
4) The responsible teacher of a course can ask for a (quick) test analysis because they want to know if a correction is justified *before* the results have been published to the students, e.g. to see if there were questions that were too difficult.

As a standard, every test analysis in situation (1), (2), and (3) will focus on three main aspects: reliability, validity, and transparency. These three aspects represent the basic quality of a test. Additionally, in case of situation (1) and (3), additional research questions will be formulated that address the issues there may have been with the exam (1) or the things the teacher wants to know about the exam (3). In situation (4), the test analysis will be less extensive (because time is of the essence in this case), with a focus on assessing whether a correction is justified before publishing the examination results.

A test analysis in situations (1), (2), and (3) always consists of two parts:

- Statistical analysis: executed by the QA officer
- Content-based analysis: executed by content experts – ideally the members of the Assessment Committee, but if the content of the exam is outside the scope of their expertise, other teachers will be asked

An overview of the test analysis process and content is presented in Appendix E.

2.12 The escalation ladder

In certain circumstances, immediate action may be needed and following the regular cycle of evaluation is not deemed desirable, either because this would take too much time and swift action is needed or because there is already a history and there is a low confidence that the steps in the regular quality assurance cycle (such as requesting an improvement plan) will lead to a satisfying and timely solution of the problem. Some examples are:

- The results of the course survey are very negative and have been so for multiple years in a row, despite attempts for improvement.
- There are signals from students or teachers *during the course* that there are serious things going wrong in a course (e.g. extremely high workload; students or teachers feeling unsafe; extreme negligence of teachers; unacceptable behavior of students).
- The pass rate of a midterm with a high weight or of a final exam is extremely low – either before or after the results are published.

In cases like these and other important and urgent matters, the Program Director has the authority to take immediate action. If rigorous action is needed, such as removing a teacher from a course or replacing an entire teacher team, the PD will discuss this with the Dean of the department. The PC and

EC will always be informed as soon as possible if the PD takes any actions that involve courses or assessment.

3. Quality assurance of the program

As can be read in the TU/e Quality Assurance Framework, the TU/e has several so-called curriculum surveys, targeted at specific groups of students at specific times. These surveys either evaluate an educational component that is not a course (i.e. the Bachelor Final Project, the Internship, and the Graduation Project) or the student's experience of the program in general in a specific period of time (i.e. the whole academic year in the End-of-Year surveys). Below, these TU/e surveys are briefly discussed. After that, it is described what happens with the results of these TU/e-wide surveys at the department of EE.

3.1 Surveys of specific educational components

3.1.1 BEP Survey

The TU/e BEP Survey is a survey that evaluates how students experienced doing their Bachelor Final Project (BEP). All students who have completed their BEP automatically receive an invitation to complete the BEP survey after their grade has been processed. The BEP survey focuses on: preparation for the BEP; level, depth, expectations of the BEP; information provision; supervision; coverage of learning objectives; clarity of assessment; professional skill development; time and effort spent; overall satisfaction with the BEP.

Every year in the autumn, the QA officer writes a report of the results of the BEP Survey of the past academic year, including a list of possible points of attention. This report is discussed with the Program Director and Program Leader of the bachelor, the Program Committee EE, the Examination Committee EE, the academic advisors of the bachelor, and StudentBody. In addition, the report is shared with all teachers via the EE Teacher Support page on Canvas. If, after having discussed the BEP evaluation results with all relevant stakeholders, improvement on certain aspects is desired, a program improvement plan will be written (see paragraph 3.3).

Every academic year, the survey will be renewed. The BEP Survey is a standardized TU/e survey, but there is some room for program-specific questions. If anyone (e.g. the PC-EE or EC-EE) has requests for specific questions to be added to the survey, they should contact the QA officer about this at the latest in July.

3.1.2 Internship Survey

The TU/e Internship Survey is a survey that is specifically developed to evaluate the internship that is part of the EE master's program. All students who have completed their internship automatically receive an invitation to complete the Internship Survey after their grade has been processed. This survey focuses on: general evaluation of the internship; background information on the type and location of the internship; preparation for the internship; support before and during the internship; supervision; assessment; time spent; professional skills development; career orientation and preparation.

The link to the Internship Survey is open the whole academic year. Every year in September, the survey is closed (and a new one updated and opened) and the data from the past academic year are analyzed. The QA officer writes a report of the results, including a list of possible points of attention. This report is discussed with the Program Director, the Program Leader of the master, the Program Committee EE, the academic advisor of the master EE, the Examination Committee EE, and StudentBody. In addition, the report is shared with all teachers via the EE Teacher Support page on Canvas. If, after having

discussed the internship evaluation results with all relevant stakeholders, improvement on certain aspects is desired, a program improvement plan will be written (see paragraph 3.3).

Every academic year, the survey will be renewed. The Internship Survey is a standardized TU/e survey, but there is some room for program-specific questions. If anyone (e.g. the PC-EE or EC-EE) has requests for specific questions to be added to the survey, they should contact the QA officer about this at the latest in July.

3.1.3 Graduation Project Survey

The TU/e Graduation Project Survey evaluates the Graduation Project of the master's program EE and AI&ES. All students who have completed their GP automatically receive an invitation to complete the GP Survey after their grade has been processed. This survey focuses on: general evaluation of the project; background information on the type and location of the organization where the student did their project; preparation for the project; support before and during the project; supervision; assessment; time and effort spent; professional skills development; career orientation and preparation.

The link to the Graduation Project Survey is open the whole academic year. Every year in September, the survey is closed (and a new one updated and opened) and the data from the past academic year are analyzed. The QA officer writes a report of the results for each program, including a list of possible points of attention. This report is discussed with the Program Leader of each program, the Program Committee of each program, the Examination Committee of each program, the academic advisor of each program, and StudentBody. In addition, the report is shared with all teachers via the EE Teacher Support page on Canvas. If, after having discussed the GP Survey results with all relevant stakeholders, improvement on certain aspects is desired, this will be set into motion.

Every academic year, the survey will be renewed. The Graduation Project Survey is a standardized TU/e survey, but there is some room for program-specific questions. If anyone (e.g. the PC-EE or EC-AI&ES) has requests for specific questions to be added to the survey, they should contact the QA officer about this at the latest in July.

3.2 General surveys

3.2.1 Transfer Survey

In December, all first-year bachelor students at TU/e receive an invitation to complete the Transfer Survey. This survey focuses on the transition from secondary education (or other previous education) to university and has the following topics: the process of choosing their study program; satisfaction with their program and with their achievement so far; satisfaction with their study approach and study skills; satisfaction with their student mentor; satisfaction with the information provision; and an overall rating of the program so far.

To this survey, 10 program-specific questions can be added. Together with the Program Director, Program Leaders, Teacher Supporter(s), and Academic Advisors, the QA officer formulates useful questions to add.

If the response rates to these surveys are sufficiently high (i.e. 20% or higher), the QA officer writes a report of the results, including a list of possible points of attention. This report is discussed with the Program Leader of the bachelor, the Program Committee EE, the academic advisors of the bachelor, and StudentBody. In addition, the report will also be shared on the EE Teacher Support page on Canvas. If, after having discussed the Transfer Survey results with all relevant stakeholders, improvement on certain aspects is desired, this will be set into motion.

3.2.2 End-of-Year Surveys

At the end of the academic year, all TU/e bachelor students and first-year master students receive the End-of-Year Survey. At the moment of writing this plan, it is unclear if pre-master students also will

receive this survey. The End-of-Year Survey aims to evaluate the students' experience in the whole academic year and to obtain insight into what elements of the program are going well and what elements may need improvement. The End-of-Year surveys focus on topics such as students' motivation, professional skills, wellbeing, satisfaction with study results, and overall satisfaction with the program. The surveys slightly differ depending on what year a student is in.

Each department can add five program-specific questions to every End-of-Year Survey. Based on current issues or questions within the department, the EE management team will decide each year which questions to add.

If the response rates to these surveys are sufficiently high (i.e. 20% or higher), the QA officer writes a report of the results, including a list of possible points of attention. This report is discussed with the Program Leaders, the Program Committees, the academic advisors, and StudentBody. In addition, the report is shared on the EE Teacher Support on Canvas. If, after having discussed the End-of-Year survey results with all relevant stakeholders, improvement on certain aspects is desired, this will be acted upon.

3.2.3 Additional general surveys

Additional general surveys can be set out on TU/e-level or on departmental level. For example, in 2022-2023, a short survey was developed to monitor and evaluate AI&ES students' first months in the program, because AI&ES was a completely new program then and we wanted to make sure everything was going well and that the students felt like they belonged. Moreover, by having such a survey rather soon in the academic year, any possible issues (which fortunately there were not) could have been quickly addressed.

3.2.4 NSE

The National Student Survey is an external survey that is sent to all students in higher education institutes all over the Netherlands. The NSE usually opens in January and closes in March. Its results usually become available in June. These results are widely used, e.g. for benchmarking (see Keuzegids and EW (previously Elsevier) Beste Studies) and for prospective students to help them choose their degree program (see Studiekeuze123). Therefore, its results are extremely important. The TU/e and the department of EE take this survey very seriously and, as such, try to actively encourage all students to participate in this survey. Once the results are in, the department of EE also uses the results to identify areas of improvement. In the summer, the QA officer makes an overview of the most important results which is shared with important stakeholders within the department after the summer holidays.

4. Quality assurance of the new bachelor program year 1

At the moment of writing this QA plan, it is still unsure how we will evaluate the new bachelor program that will start in September 2023-2024. There are two options:

1) We will evaluate the new program with the so-called Quarter Surveys after every quarter. These surveys include questions about the individual courses, about the quarter as a whole, and about the program in general. For more information about this new way of evaluating, see the document “Proposal Q Survey EE”.
2) We will evaluate the new program in the same way as we evaluate the current program.

Which option it will be, depends on the outcome of ongoing discussions with the central QA department and General Affairs. In both cases, the quality assurance process *after* the survey(s) will roughly be the same as described in this QA plan (e.g. results are discussed in the PC and EC, follow-up actions will be taken if necessary). The differences are, however, that in case of the Quarter Surveys, the results will be reported in a different way, with less focus on individual courses and more focus on (students’ experience with) the quarter and program (so far) as a whole. Moreover, these results will also be discussed in a Quarter Meeting together with all teachers of that quarter.

Appendix A. Example course overview

5XXX0: Example Course

YXQX BC EE major course

Legenda

All answer scales go from 1 to 5 (unless stated otherwise), where 5 is the best or most strong agreement with the statement.

bad score (<3.0 on scale 1 to 5)

good score (>4.0 on scale 1 to 5)

high difficulty/effort (>4.0 on scale 1 to 5)

Evaluation survey

Quantitative data

Evaluation information	**2019-2020**	**2020-2021**	**2021-2022**
n recipients	40	58	61
n responses	10	15	21
Response rate	25%	26%	34%

Notes

Study program of students	**2021-2022**
B Applied Physics	5%
B Automotive Technology	15%
B Biomedical Engineering	10%
B Electrical Engineering	55%
B Psychology & Technology	10%
Other	5%

The course in general	**2019-2020**	**2020-2021**	**2021-2022**
Overall rating (1-10)	6.9	7.3	7.3
Set-up	3.7	3.9	3.6
Organization	4.3	3.9	4.1
Course material	3.5	3.6	3.8
Assessment	4.3	3.9	3.8

Studying for this course	**2019-2020**	**2020-2021**	**2021-2022**
Difficulty (1: very easy, 5: very difficult)	2.6	3.1	2.9
Effort (1: effort << ECTS, 5: effort >> ECTS)	1.9	2.8	2.5
Percentage of attended teaching sessions			
0-60%	-	33%	28%
61-80%	-	17%	22%
81-94%	-	17%	33%
95-100%	-	33%	17%

Effort is quite low.

Teachers in this course	**2019-2020**	**2020-2021**	**2021-2022**
Dr. ir. A	3.7	4.0	3.5
Dr. ir. B	3.8	3.7	4.5

Course-specific questions	**2019-2020**	**2020-2021**	**2021-2022**
In general, the English language proficiency of the	-	-	4.1

teacher(s) in this course is good.			
I was offered sufficient (online) opportunities to ask questions on the subject matter.	-	4.1	4.1

Qualitative data

What did you like?	**20-21 9 answers**	**21-22 14 answers**
Fascinating topic / Region of interest / Interesting course material / The overall view is really interesting / Combination in topics	5	8
Slides and reader clear	-	3
The direct link to actual cases / Very well explained how it relates to real-life technologies / The practicality of the material, all the examples in which the information is used	3	2
Setup / Presence of midterms for intermediate feedback	-	2
Kind lecturers	-	2

What would you like to improve?	**20-21 9 answers**	**21-22 14 answers**
More exam practice possibilities / More practice exercises	2	9
Part X hard to follow / Lot of mathematical derivations	-	3
The first part of X went very slow and a lot of information was already known to me	2	2

Examination results

Final examination	**2019-2020**	**2020-2021**	**2021-2022**
n students in course	40	58	61
n made exam	33	48	47
n exam grade >1	32	48	47
n exam grade ≥5.5	18	26	23
% pass all students	45%	45%	38%
% pass students who made exam	55%	54%	49%
% pass students >1	56%	54%	49%
Average grade >1	5.6	5.7	5.6

Notes
Final examination was a written exam of 70% *Quite some no-shows* *Final exam pass rate seems low, but 10 students had a grade between 5.0 and 5.5, so they could compensate with the midterm grade.*

Overall course pass rate	**2019-2020**	**2020-2021**	**2021-2022**
All students after attempt number			
1	60%	57%	52%
2	70%	79%	74%
Serious students (grade >1) after attempt number			
1	67%	62%	63%
2	78%	87%	88%

Large difference between pass rate after 1 attempt and pass rate after 2 attempts.

Teacher's evaluation

Feedback provided to students
Thank you for the feedback! • *The Matlab assignments/instructions were new this year, I'm glad they were appreciated.* • *I agree that the slides are not so self explanatory (without the lecture). I'll take note to make them more suitable for self study by including some additional notes/clarification where this is most critical.*

Looking back
Satisfied course?
We were happy that the lectures could take place live, but were disappointed with the low attendance by students.
Satisfied students' results?
The pass rate is in line with previous years. Many students who did not pass did also not actively participate in the course.
Satisfied students' evaluation?
- In general we are happy with the evaluation. There are some personal preferences for the students in ways of teaching and what material is available, but it is difficult to satisfy all. We think that we offer a good variety of teaching methods and material. For instance, some students would like to see lecture notes for the second half of the course, but there are good books available. - Topic-wise, students see the connection to real-life applications and appreciate that. - For the second year already, we're using the discord server which is appreciated very well. For us it is also a quick and easy way to answer questions.

Looking forward
Changes planned?
- In general we would like to continue the positive cooperation between the two modules in the course. No major changes foreseen. - Some more practice material should be made available (and more timely) for part A. - For part B, additional hands-on work is foreseen.
Resources needed?
None expected. The help with ANS Delft was excellent this year.

Other input

StudentBody
November 2021: • There are no exercises yet. **December 2021:** • The course is fine. The pace is still not very high. It is nice that examples (such as Ph.D. projects) are shown in the course. **January 2022:** • The content of the midterm was fine.

Appendix B. Stumbling-block courses question block

1. <Name course> is one of the courses in the Electrical Engineering curriculum with a low pass rate. In your opinion, what are the reasons for this low pass rate?
<open>

2. Did you have sufficient prior knowledge to successfully follow this course?
<5-point scale: No, definitely not – Yes, definitely>

3. If you feel you did not have sufficient prior knowledge, what knowledge did you miss?
<open>

4. What do you think about the amount of content you have to master in this course?
<Single choice: Way too much content; Too much content; Just the right amount of content; Too little content; Way too little content>

5. What do you think about the pace of the course?
<Single choice: Way too fast, I could not keep up; Too fast; at times I could not keep up; Just the right pace; Too slow; Way too slow>

6. Did you have sufficient opportunity, time, and/or material to practice the material on an exam-level?
<5-point scale: No, definitely not – Yes, definitely>

7. If you indicated you did not have sufficient opportunity, time, and/or material to practice the material on an exam-level, please elaborate why not.
<open>

8. What do you think about the coherence of this course (i.e. the way different parts and subjects formed a unified whole)?
<5-point scale: Not coherent at all – Very coherent>

9. What would be your advice to improve the pass rate of this course?
<open>

Appendix C. Course improvement plan process

POST-COURSE YEAR A

1) The PD – or the EC if it concerns assessment – requests an improvement plan from the responsible lecturer. The reasons for the improvement plan will be made clear in this request and the Improvement Plan Format EE, which teachers can use if they want to, will be shared. The section in the template that states which problems are to be addressed in the improvement plan can already be filled in by the QA officer. If deemed desirable, representatives from the PC or EC, the QA officer, Teacher Supporter and/or Program Director or Leader set up and prepare a meeting with the responsible lecturer.
2) The responsible lecturer will write an improvement plan. The Teacher Supporter and QA officer can provide assistance if needed.
3) The responsible lecturer sends the improvement plan to the PD, who can, with the help of the Teacher Supporter and QA officer, can perform a first check, focusing on if (i) the plan is clear; (ii) addresses the issues that were the reason for requesting the improvement plan; (iii) is feasible; and (iv) if the improvements are measurable. If the plan does not meet these criteria, this can be discussed with the responsible teacher.
4) The PD will share the improvement plan with the PC (or EC if it concerns assessment).
5) The PC or EC will discuss the improvement plan in their meeting. The responsible lecturer can be invited to this meeting to elaborate on the plan and to answer questions from the committee. In this meeting, the committee can give the teacher advice on their plan.

PRE-COURSE YEAR B

6) Courses with an improvement plan are on the priority list of Teacher Support. As such, a couple of weeks before the start of a new quarter, the Teacher Supporter will have a preparatory session with the responsible lecturer of the course that has an improvement plan. The Teacher Supporter will discuss the implementation of the improvements that were detailed in the improvement plan with the responsible lecturer: is it all going according to the improvement plan? Are there any issues with the implementation? Is more help needed?

DURING THE COURSE YEAR B

7) At the end of the quarter, the draft for the course evaluation survey will be ready in Evalytics. In the improvement plan, the teacher has already proposed questions that will measure whether the suggested improvements are successful. The QA officer will already add these questions to the survey. The responsible lecturer can indicate whether these questions are adequate for the implemented improvements or if they need to be adapted.
8) The QA officer will closely monitor the course by – among other things – attending the SB Panel of Education meetings (meetings where they discuss issues in ongoing courses) and asking the SB for input. Things that will be monitored are (a) if the changes that were listed in the improvement plan were actually implemented (successfully); and (b) how the students perceive these changes. If deemed desirable, additional monitoring and evaluation methods can be arranged, e.g. a midterm evaluation (e.g. a Canvas quiz) or by asking a small number of students to function as a sounding board throughout the course.

POST-COURSE YEAR B

9) Once the course has ended, the QA officer will flag the course in the course overview, so that it is immediately visible that this course had an improvement plan in the previous year. In the course overview, a section will be added that specifically addresses the evaluation of the improvements.
10) When the course overviews are discussed in the PC and the EC, or between the QA officer, Teacher Supporter and PD and PLs, it will be concluded whether they think the improvements were successful or not. If the improvement is successful and does not require additional actions, the responsible lecturer can be sent a letter of compliments. If the improvements were not successful, additional action can be taken (i.e. more information can be gathered or a new improvement plan can be asked), and the process continues at the items listed at POST-

COURSE YEAR A. In the extreme and highly unlikely case in which it is clear that the teacher has not put in sufficient effort into actually making changes in the course, the PC-EE can give the PD the advice to escalate the situation (see paragraph 2.12 The escalation ladder).

Appendix D. Template course improvement plan

Course Improvement Plan of the department of Electrical Engineering

Template

Course:
Part of which program(s)?:
Academic year the improvements will be implemented:
Quarter:

Responsible lecturer:

Version history:

Version	*Date*	*Discussed by*	*Results/changes/status*

1. **Reason for the improvement plan**

What are the issues in the course that are addressed in this improvement plan?
[If desired, this can be filled in by QA Officer, so that it is clear for all parties what the improvement plan should focus on]

2. **Goals**

What are the goals of the improvements? Please write them as SMART as possible (specific, measurable, achievable, relevant, time-bound).

3. **Action plan**

How are you planning to achieve the goals? Make sure to address:

a) *What changes will be made in the course next year?*
b) *How/why do you think these changes will help in obtaining the goals described in 2?*
c) *Who is involved in implementing these changes?*
d) *What resources are needed (e.g. money, time, additional teachers, help from Teacher Support, TAs, tools)?*
e) *When do you want to implement these changes (e.g. all changes in the next run of the course, or a more gradual approach over the years)?*
f) *Are there any factors that may hinder the achievement of the goals described in 2 or factors that may hinder implementing the changes? How do you plan to address these factors, if possible?*

4. **Evaluation of improvement plan**

a) *How do you plan to evaluate if the improvements are successful?*
b) *Please formulate some questions that can be added to the evaluation of the course next year to check if the improvements were successful.*

Appendix E. Overview of the test analysis process and content

Before the test analysis

Needed from responsible teacher:

1) Assessment plan
2) Final exam + instructions ('oplegvel')
3) Grading scheme of the final exam (solutions or rubric + weight/points per question)
4) Anonymized raw data (e.g. Excel) of the results of all students (points per question/assignment, total number of points, final grade)
5) If relevant: A sample of at least 6 assessed exams, of which – if applicable – at least 2 with an insufficient grade, 2 with a 'just sufficient' grade, and 2 with a good grade
6) If relevant: (1), (2), (3), and (4) from previous year(s)
7) If applicable: an explanation of why there was a deviation from the original grading scheme (e.g. not counting certain questions, changing the norm)

Already available through QA officer:

8) Course evaluation results regarding the examination
9) Pass rate data from previous years

Standard aspects of a test analysis

Basics

- Histogram of grades, average, standard deviation, pass rate of all students, pass rate of all students who made the exam, pass rate of all students who obtained a grade higher than 1

Reliability

- Does the final exam have sufficient reliability and internal consistency? In case of a high number of students, statistical analyses can be performed to determine Cronbach's Alpha of the total exam (internal consistency, should ideally be at least .60).
- In case of multiple examiners: is the grading consistent? I.e. do students' grades not depend on which examiner graded them?
- Do all separate items contribute to the students' final score in a meaningful way? To assess this, we look at the item-total statistics (Rit value): how high is the correlation between a student's total score on the exam and the student's score on a separate item? The Rit should be >.15, otherwise it is an indication that the item is a trick question, the answer model is wrong, or the item refers to an independent part of the content matter.

Validity

- Does the final exam have sufficient content validity? Here, it will be assessed whether the exam covers the learning objectives of the course in a representative and even way.

- Is the length of the exam okay? An exam that is either too long (and time pressure or not being able to finish all questions could bias students' exam results) or too short will decrease the validity.
- Are the questions of the exam of sufficient quality? Here, content experts will review the questions of the exam. E.g., are the questions clear, well-formulated, and not open to multiple interpretations?
- Does the difficulty of the questions seem adequate? Content experts can assess this, and, in case of a high number of students, we will do statistical analysis to determine the *p* value (difficulty) of the separate exam (sub) questions. Questions that are too easy (high *p* value) or too difficult (low *p* value) should be kept to a minimum.

Transparency

- Is the assessment plan clear and complete?
- Are the exam instructions clear?
- Is the answer model/rubric clear?

Report of test analysis

The QA officer will write a brief report of the findings of the analysis. This will be discussed with the responsible teacher and with the Examination Committee. In case the test analysis was part of a request for an improvement plan, the responsible teacher can use the results of the test analysis to write an improvement plan on how he/she will improve the examination in next year. The Quality Assurance officer and the Teacher Support officer of the ESA EE team can provide support.