

# **Quality Assurance Plan of the department of Applied Physics and Science Education**

Academic year 2023-2024

Applies to:

- Bachelor of Applied Physics
- Master of Applied Physics
- Master of Science & Technology of Nuclear Fusion

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## 1. Introduction

The TU/e Education Quality Assurance Framework<sup>1</sup> outlines the quality assurance system and the joint agreements and preconditions that departmental quality assurance must meet. The Quality Assurance Plan (QA plan) of the department of Applied Physics and Science Education (APSE) describes how the quality of education is guaranteed and how the education improvement cycle is closed (1) at the level of all individual courses and (2) at the level of the study programs for which the department of APSE is responsible. This QA plan is applicable to the bachelor of Applied Physics, the master of Applied Physics, and the master of Science and Technology of Nuclear Fusion (NF). The latter is offered as an interdepartmental master's program by the department of Applied Physics and Science Education, the department of Electrical Engineering and the department of Mechanical Engineering at TU/e. The department of Applied Physics and Science Education is the coordinating department and, as such, responsible for the quality assurance of this interdepartmental master's program.

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 AP Quality Assurance Plan has a strong practical focus by specifying the actions that different actors in the department take to guarantee high quality AP and NF education.

This QA 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)
- The 'old' year-1 theoretical and elective bachelor courses will be evaluated with two brief surveys: one half way the quarter and one after the final exam (see paragraph 2.2)
- The QA plan contains an extra paragraph about the quality assurance of the new bachelor program Applied Physics (see paragraph 4)

## 2. Quality assurance of individual courses

### 2.1 The view of AP on course evaluation

According to the TU/e QA Framework, courses that (1) perform well – i.e. have at least an overall rating of 7 on a scale of 1 to 10 for the last three years – and (2) have not had any major changes in teachers, educational methods, assessment, etc. only have to be evaluated (i.e. the evaluation survey has to be sent to students) once in three years. As of academic year 2023-2024, the department of APSE also applies this directive, because the department wants to prioritize the evaluation of the new bachelor program AP (see paragraph 4) and because the response rates to the course evaluation surveys have been decreasing the last three years.

This means that a course will be evaluated via the formal course evaluation survey in the following cases:

- (1) the course has scored an average overall course rating of 6.9 or lower in the last three years, and/or
- (2) the course has had one or more major changes in teachers, educational methods, assessment, etc. These courses will be identified by the Quality Assurance officer after consultation with the Teacher Supporter, and/or,
- (3) there is a substantiated request for a formal course evaluation from the Program Director, Program Committee, Examination Committee, submitted to the Quality Assurance officer.

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<sup>1</sup> The TU/e Educational Quality Assurance Framework will be updated. At the time of writing this document, the new framework is not yet ready, so this document is based on the previous framework.

In cases where a course will not be automatically evaluated, the Quality Assurance officer 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. As an additional check, the QA officer asks internally if there are teachers who are participating in the UTQ module.

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 come to a justified conclusion regarding the educational 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 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) If available and relevant: other input, e.g. input from STOOR (STudent educatiOn ORganization AP), information gathered during student feedback sessions by student members of the Program Committee of Nuclear Fusion (PC-NF), or input from the Center for Student Administration (CSA), such as teachers who exceeded the official grading deadline.

The different types of input listed above are combined into an overview of every course, the course overview. First of all, this course overview is sent to the responsible teacher of the course. Second, all course overviews of a certain quarter are combined into a quarter overview. The QA officer prepares three quarter overviews after every quarter: one of all overviews of AP bachelor courses of that quarter (i.e. all bachelor courses offered by the department of APSE and all courses that are part of the AP major, also if they are offered by another department, such as the department of Mathematics and Computer Science); one of all overviews of AP master courses (i.e. all master courses offered by the department of APSE except the courses that are dedicated NF courses and all courses that are part of the AP master, also if they are offered by another department (i.e. the track electives 4EM10, 6EMA53, 5LHB0 and 5LFB0)); and one of all overviews of NF master courses (i.e. courses that are mandatory courses of the NF master and courses that are listed in the study guide NF as track electives, offered by the departments of APSE, EE, and ME). Appendix A shows an example of a course overview.

Because 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 wanting to give the teacher some time to reflect on the evaluation results and grades – it can take up to six weeks after the quarter until the overviews are ready. For the bachelor and master of AP, it is our goal to have processed and discussed courses of quarter x before quarter x+2 starts. For the master of NF, it is our goal to have processed and discussed courses of quarter x before quarter x+3 starts (due to the lower frequency of PC-NF meetings).

## 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 the 'old' year-1 theoretical bachelor courses, two evaluation surveys will be sent out. The first survey, sent out half way the quarter via Canvas, evaluates the provided course material and the extent to which students feel well prepared for the final exam. If the provided course material does not sufficiently help the students to pass the course, we will ask what they think they need in order to pass. The second survey will be sent out via

Evalytics after the exam weeks, to evaluate the final assessment. The goal of that survey is to assess the difficulty and validity of the exam. 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.

Students who are enrolled in the final exam of the following 'old' year-1 theoretical bachelor courses will receive both surveys:

- 3AKX0 Variables, Dimensions and Dynamics
- 3AMX0 Mechanics
- 3AEX0 Electromagnetism
- 2DBN00 Linear Algebra

Students who are enrolled in the final exam of the following 'old' year-1 elective bachelor courses will also receive both surveys:

- 3DEX0 Physics of Energy
- 3DBX0 Biological Physics

## 2.3 Role of the Program Committee in course evaluation

The quarter overviews are shared with and discussed in the relevant Program Committee (PC, with a specific focus on the survey results and teacher's input): the AP bachelor and master overviews are discussed in the PC-AP and the NF master overview in the PC-NF. 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 needs specific attention from either a PC or an EC. 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. Usually this will be the case if the quantitative scores from the student evaluation 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 (STOOR, CSA) do not signal any significant issues or action points.

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

(a) The PC concludes that the current course overview does not convince them that the *educational part* of the course is of sufficient quality and conclude 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 will take action to 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 Program Committee, after which the PC will decide if they are convinced that the course is doing fine and no further action has to be taken or if they will move on to the next step (3), i.e. requesting an improvement plan.

(b) The PC concludes that they do see 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 growing pains; 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.

### 3. Major issues → improvement plan required

The PC concludes that a course is not performing well and that there are serious issues that need to be addressed. The PC requests an improvement plan from the responsible lecturer (see paragraph 2.9 Course improvement plan). The Program Director (PD) is closely involved in this process, as they are ultimately responsible for the quality of education.

## 2.4 Role of the Examination Committee in course evaluation

The quarter overviews are shared with and discussed in the relevant Examination Committee (EC); the AP bachelor and master overviews are discussed in the EC-AP and the NF master overview in the EC-NF. The EC focuses on the quality of assessment and on students' results. 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 needs specific attention from either the PC or the EC. 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. Usually this will be the case if the course pass rate – based on 'serious' participants (i.e. grade >1.0) – is in line with the pass rate of previous years and ideally not lower than 50% in a bachelor's course and not lower than 60% in a master's course; if there were no problems with or complaints about the examination; if the quantitative scores from the student evaluation survey related to assessments are average to good ( $\geq 3$  on a scale of 1 to 5); and if the qualitative results from the student survey, the input from the teacher, and other input (STOOR, PC-NF student feedback sessions, CSA) do not signify any significant issues or action points.

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

a) The EC concludes that the course overview does not convince them that the *assessment part* of the course is of sufficient quality OR they conclude that the pass rate of the course seems problematic. The EC, or the QA Officer on behalf of the EC, will contact the teacher for more information (i.e. explanation and future actions to improve).

b) The EC concludes that they do see 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.

### 3. Major issues → improvement plan required

The EC concludes that there seem to be major issues with the assessment or that the pass rate is very problematic (e.g. extremely low or extremely high). On behalf of the EC, the QA officer will contact the teacher and set up a meeting with them, together with at least one other member of the Assessment Committee (a subcommittee of the EC that focuses on assessment). Moreover, the QA officer will request the exam, the solutions or a rubric, and the Excel file with detailed exam results (i.e. scores of students per (sub)question of the test) from the responsible teacher. The Assessment Committee will do a thorough test analysis of the examination (see paragraph 2.10 Test analysis): the QA officer will do a statistical analysis and the other members of the Assessment Committee will do a content analysis. The results will be discussed with the responsible teacher and with the EC. Depending on the conclusion of the analyses and input from the teacher, some action points will be formulated together. The QA Officer will take note of these and will monitor if they are followed up. The PD is closely involved in this process, as they are ultimately responsible for the quality of assessment.

## 2.5 Notes regarding the roles of the PC and EC in course evaluation

Although the PCs and ECs have their own role and own focus, these roles are not always as strictly distinct as implied in the paragraphs above. Moreover, it may happen that both committees see a need to take action regarding the same course. Therefore, in some cases it is desirable to connect and align the processes of the PC and EC regarding course evaluation and improvement, so that the responsible lecturer does not receive comparable or diverging requests from two committees. The QA officer, who is an advisor in both committees, will ensure that a responsible teacher is not overcharged from two committees at the same time.

A second point of attention relates to the discussion of course evaluation results during a PC or EC meeting. Prior to discussing the quarter overviews, the chair of the PC or EC will ask whether any teacher members of the PC or EC were involved in the courses of the quarter that is going to be discussed, so that the chair is aware of this. There should be no conflicts of interests, and it is up to the chair how to proceed (e.g. the chair can ask a member to leave if their course is the topic of conversation).

## 2.6 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 important to align processes with the other department. The QA officer can take the lead in this case, by contacting the QA officer of the other department to find out what actions are taken by that department, if any. If no actions are taken, the QA officer of the department where the issues are identified can take the lead for follow-up actions (e.g. a course improvement plan, see paragraph 2.10). It is important to mention here that the department providing the course (reflected in the course code) is ultimately responsible for the quality of education and the Program Director of this department should therefore always remain involved in the follow-up actions.

## 2.7 Note regarding the role of the responsible lecturers in course evaluation

The processes above describe that if the PC or EC has concerns regarding a course, the QA officer will contact the responsible lecturer for further information, for an open conversation about the course, or to provide documents (e.g. in case of a test analysis). The department of APSE expects responsible lecturers to collaborate with such requests. It is important to note that such requests do not have the intention to 'blame' the teacher, but have the goal of improving education and assessment. The responsible lecturer can decide whether or not they also want to involve the co-lecturers in the process.

## 2.8 Importance of the historic perspective

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

## 2.9 Stumbling-block courses

Stumbling-block courses are courses that have had a low course pass rate in at least two of the last three academic years. A "low pass rate" in a bachelor's program is operationalized as <50% of serious students passing a course after one attempt; and/or <70% of serious students passing a course after two attempts. A "low pass rate" in a master's program is operationalized as <60% of serious students passing a course after one attempt; and/or <80% of serious students passing a course after two

attempts. Stumbling-block courses are courses that play a large role in study delay, and, as such, should be monitored extra closely. Ideally, the number of stumbling-block courses in a program is as low as possible. The QA officer has a list of courses offered by the APSE department that can currently be regarded as stumbling-block courses.

Making sure that the stumbling-block courses are of optimal quality is essential in the light of improving the median study duration of our programs. To continually monitor and improve stumbling-block courses, these courses receive extra attention in the quality assurance cycle. To thoroughly monitor their quality and to identify issues that contribute to the low pass rate of these courses, a stumbling-block-courses question block can be added to the evaluation form of those courses, if the responsible teacher agrees to this. This question block is shown in Appendix B.

If multiple issues are at play in a stumbling-block course or if one large issue that is not easily addressed is at play (e.g. issues in the curriculum that cause problems in that specific course, such as insufficient prior knowledge), it is advised to set up a project group that will focus on improving the course and – if possible, on the long term – (the place of the course in) the curriculum. Project group members are at least the responsible teacher (preferably also the co-lecturers if applicable), a teacher member of the PC, a student member of the PC, a member from STOOR, the QA officer, and the teacher supporter. In case of assessment issues, a member of the Examination Committee or Assessment Committee should be part of this group as well. The PD – if not an active member of the project group – will be regularly updated by the QA officer about the progress being made by the project group and has to give consent to the decisions and actions that are being proposed by the group. The QA officer will monitor and evaluate possible actions that are taken.

## 2.10 Other stakeholders in course evaluation

In addition to the PC and EC, the quarter overviews are always discussed with the Program Director (PD), the Teacher Supporter, and STOOR (as student stakeholders).

The PD of the department of APSE is ultimately responsible (mandated by the dean) for the quality of the education and assessment of the Bachelor's and Master's program Applied Physics and the Master's program Science and Technology of Nuclear Fusion. 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 evaluation overview, the PD takes immediate action (see also paragraph 2.11 The escalation ladder).

When discussing the course overview, the Teacher Supporter will specifically focus on teachers' needs for the next run of the course (e.g. didactic advice, extra TAs, specific resources, help in general).

The QA officer has close contact with STOOR and meets with one of the members at least once every quarter to discuss the course overviews of the previous quarter. This student 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 STOOR will always take place before the course overview is discussed in the PC and EC meeting. For NF, the student members of the PC-NF organize feedback sessions with the NF students. After every quarter, they send the feedback they have gathered to the QA officer, so that this feedback can be included in the quarter overview.

All students of (programs offered by) the department of APSE are crucial stakeholders in course evaluation and the quality assurance cycle in general. 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 is used since academic year 2022-2023.

## 2.11 The course improvement plan

If a PC and/or EC signal major issues with a course, they will request a course improvement plan from the responsible lecturer. Also the Program Director, in consultation with the Teacher Supporter and the QA officer, can request a course improvement plan. It is of the utmost importance that there is a clear follow-up *after* the course improvement plan has been written and approved by the committee who has requested the plan. The responsible lecturer is responsible for executing the proposed actions in the improvement plan. 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.

## 2.12 Test analysis

A test analysis can be requested from the QA officer in four 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.

## 2.13 The escalation ladder

In certain circumstances, the PD has to take immediate action, because following the regular cycle of evaluation is not deemed desirable. This can either be because following the regular processes 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 evaluation cycle (such as requesting an improvement plan) will lead to a satisfying solution of the problem. Some examples are:

- The results of the student evaluation 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 PD has the authority to take immediate action, as they are ultimately responsible for the quality of education and assessment at the department. 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 End 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 APSE.

#### 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, the PC-AP, the EC-AP, the Academic Advisor of the bachelor, and STOOR. In addition, the report is shared with all teachers via the AP 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-AP or EC-AP) 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 AP and NF master's programs. 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 PC-AP, the PC-NF, the Academic Advisor of the masters AP and NF, the EC-AP, the EC-NF, and STOOR. In addition, the report is shared with all teachers via the

AP 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-NF or EC-AP) 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 programs AP and NF. 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 Director, the PC-AP, the PC-NF, the EC-AP, the EC-NF, the Academic Advisor of the master's programs, and STOOR. In addition, the report is shared with all teachers via the AP Teacher Support page on Canvas. If, after having discussed the GP Survey 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 Graduation Project Survey is a standardized TU/e survey, but there is some room for program-specific questions. If anyone (e.g. the PC-AP or EC-NF) 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 and first-year master 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 or on the transition from bachelor to master education 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, Teacher Supporter, 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 detailed report of the results, including a list of possible points of attention. If the response rates to these surveys are not sufficiently high (i.e. lower than 20%), the QA officer decides, based on the results, whether or not a detailed report or a short summary is needed. The report or summary is discussed with the Program Director, the PCs, the ECs, the Academic Advisors and STOOR. In addition, the report will also be shared on the AP Teacher Support page on Canvas. If, after having discussed the Transfer Survey results with all relevant stakeholders, improvement on certain aspects is desired, a program improvement plan will be written (see paragraph 3.3).

### 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.<sup>2</sup> This 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 AP ESA 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 detailed report of the results, including a list of possible points of attention. If the response rates to these surveys are not sufficiently high (i.e. lower than 20%), the QA officer decides, based on the results, whether or not a detailed report or a short summary is needed. The report or summary is discussed with the Program Director, the PCs, the ECs, the Academic Advisors, and STOOR. In addition, the report is shared on the AP Teacher Support on Canvas. If, after having discussed the End-of-Year survey results with all relevant stakeholders, improvement on certain aspects is desired, a program improvement plan will be written (see paragraph 3.3).

### 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, together with STOOR, a survey for international students within the department of APSE was sent out. By this survey, we got a better idea of how international students experienced their student time at TU/e and particularly at our department, and the results were used as input for the International Classroom project group. Next to that, we also developed a short survey on mentoring in the master. This survey was sent out to both students and mentors and their input is essential for improving the mentoring program.

### 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 and for prospective students to help them choose their degree program. Therefore, its results are extremely important. The TU/e and the department of APSE 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 APSE also uses the results to identify areas of improvement. In the summer, the QA officer will make an overview of the most important results which will be shared with important stakeholders within the department after the summer holidays.

## 3.3 Program improvement plan

The department of APSE wants to work in a more systematic way on improvements in the program that surpass the level of individual courses. Moreover, the department aims to improve the process of closing the loop regarding the surveys of "non-course" educational components (BEP, internship, Graduation Project) and the general surveys (Transfer Survey, End-of-Year Survey, NSE) that are described in paragraphs 3.1 and 3.2. To make sure program improvements are carried out in a systematic way, the following process can be followed.

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<sup>2</sup> At the moment of writing this document, it is unclear if pre-master students will also receive this survey.

1. Results of evaluations of non-course educational components and results of general surveys are carefully analyzed and reported by the QA officer. To make sure the evaluation results are read, a to-the-point one-page summary will always be part of such a report.
2. This report is shared and discussed with the PD and all other relevant parties within the ESA team (most importantly the Teacher Supporter and Academic Advisors).
3. This report is shared and discussed with the Program Committee (with a focus on the program) and the Examination Committee (with the focus on assessment).
4. Based on the discussions with the people and committees above, the most important and/or urgent points for improvement will be determined – if any.
5. An improvement plan that focuses on these points will be written by the QA officer and/or people who are closely involved in the issues that are addressed.
6. This improvement plan will be discussed with the same parties as mentioned in (2) and (3).
7. If approved, the implementation of the improvements will start. The responsible individuals for the implementation of the improvements will depend on the improvements. The PD is the final responsible person.
8. The QA officer is responsible for monitoring (and, if necessary, midterm evaluating) the execution of the improvement plan.
9. In the same survey a year later, the results of the improvement will be evaluated. The QA officer will report to what extent the improvements were successful.

Appendix F shows the template of a program improvement plan. Examples of course-surpassing issues that could be systematically addressed with the process described above are generic issues regarding professional skills, low attendance of educational sessions, and causes of study delay.

We realize that we have not actively used this improvement plan (from step 5 onwards) in recent years. We do intend to implement the program improvement plan in the new bachelor program, where necessary. This will be discussed in more detail in the next paragraph.

#### 4. Quality assurance of the new bachelor program

In academic year 2023-2024 Bachelor College 2.0 will start. The quality of education needs to be closely monitored and courses and other elements of the program (e.g. the Personal and Professional Development (PPD) learning line) need to be adjusted where necessary. This evaluation takes places at course and program level, both during and after the quarter. Table 1 shows the quality assurance of the new bachelor program for year 1.

Table 1. Quality assurance of the new bachelor program

|               | <b>What</b>              | <b>Why and how</b>   | <b>Who</b>  | <b>When</b> |
|---------------|--------------------------|--|---|-------------|
| Course level  | Focus groups (4.1.1)     | Improvement of an <i>ongoing</i> course with immediate feedback from students to teacher during informal meetings after each educational session.  | - Teacher<br>- Group of students<br>- STOOR   | Weekly      |
|               | STOOR Council (4.1.2)    | Improvement of an <i>ongoing</i> course with gathered feedback from students to teachers during a meeting.   | - STOOR<br>- Teachers<br>- QA officer   | Quarterly   |
|               | PC / EC meetings (4.1.3) | Evaluation of <i>finished</i> courses, based on survey evaluation results, feedback from the focus groups, minutes STOOR councils, pass rates and teacher's evaluation, during the regular PC/EC meetings. | - Committee members<br>- Program Director (for the EC, by invitation)<br>- QA officer (for the EC, by invitation) | Monthly     |
| Program level | Quarter meetings (4.2.1) | Stimulate alignment and share experiences between teachers of a specific quarter and between teachers and ESA-AP during a meeting.   | - Teachers of one quarter<br>- Program Director<br>- A selection of ESA-AP members (TS, AA, QA)                   | Quarterly   |

|  | <b>What</b>                    | <b>Why and how</b>   | <b>Who</b>  | <b>When</b> |
|--|--------------------------------|--|---|-------------|
|  | Learning line meetings (4.2.2) | Stimulate alignment between teachers from the same learning line and monitor proper implementation of the learning objectives along an entire learning line, during a meeting. | - Coordinator of specific learning lines<br>- Teachers within specific learning lines<br>- Program Director<br>- QA officer | Quarterly   |
|  | Curriculum meetings (4.2.3)    | Evaluation of the content and assessment of the curriculum, based on survey data during a meeting.   | - Delegate of the PC<br>- Delegate of the EC<br>- Program Director<br>- QA officer  | Semesterly  |

#### 4.1 Quality assurance of individual courses

The evaluation of the individual courses will happen in the same way as described in paragraph 2. Since all courses in year 1 of the new bachelor program are either new or completely or partly redesigned, they will all be evaluated with the formal course evaluation survey. The course evaluation surveys for each course could be combined for courses within the same quarter to enhance coherence and efficiency of the surveys, and to reduce survey fatigue among students.<sup>3</sup>

Besides the formal course evaluation surveys, there will be meetings to gather and discuss in-depth feedback about the progress of a course or on how the course went. There are three ways in which additional feedback will be gathered, of which the focus group (see paragraph 4.1.1) is a new evaluation method, specifically set up for the quality assurance of the new bachelor program.

##### 4.1.1 Focus groups (new)

For each first year bachelor course, every teacher forms a focus group ('collegevolggroep' in Dutch) of 4 to 8 students. The Teacher Supporter will point this out to the teacher during the intake meeting with every responsible teacher, before the start of the quarter. The QA officer is able to help the teacher in setting up the focus group. In the first lecture, the teacher asks who will join the focus group. These groups of students gather feedback during the course and report to the teacher in an informal way. The gathered feedback will be related to minor issues during the course, which can be solved relatively easy by the teacher.

The teacher takes the lead in the focus group and monitors the process. In the Quarter meetings (see paragraph 4.2.1) the teacher will discuss their observations and conclusions regarding the course's progress. The goal of the focus group is to improve the course while it is still running, so that current students can still benefit from it.

##### 4.1.2 STOOR Councils

The STudents educatiOn ORganization (STOOR) hosts study councils every quarter. During this council, the gathered feedback about the ongoing courses is shared by STOOR members and discussed with the lecturers in an informal setting. Feedback on the assessment of the previous quarter is also discussed. The STOOR councils are already organized within the department of APSE and with the start of the new bachelor program, these councils will be strongly related to the focus groups as discussed in the previous paragraph.

Students themselves, represented by STOOR, are in the lead in the organization of, and the discussions during the council. The councils take place every quarter. Next to the students and teachers, the QA officer will be present during the council. The goal of the STOOR council is the same as for the focus groups: improvement of ongoing courses where the current students can still benefit from. In these

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<sup>3</sup> A proposal for this new way of evaluating the entire quarter instead of individual courses, is the Quarter survey, initiated by Els van Rooij (QA officer of Electrical Engineering) and Diana Sonnemans. At the time of writing this document, it is not yet clear if the Quarter surveys can be implemented. Therefore, it is mentioned as an option in this document.

councils, all running year-1 courses will be discussed and, consequently, the responsible teachers of these courses will be invited. We expect that at least one of the members of the teacher team will attend the council.

#### 4.1.3 PC/EC meetings

All feedback on the courses – this includes results from the formal course evaluation surveys, feedback from the focus groups, minutes of the STOOR councils, the exam and course pass rates and the teacher's evaluation of the course – will be discussed during the regular PC and EC meetings (monthly). The quality assurance process is the same as for the current program and is in detail discussed in paragraphs 2.3 and 2.4.

### 4.2 Quality assurance of the program

Besides the evaluation of the individual courses, there is also the need and urgency to evaluate the new bachelor program as a whole. For this, the results from general curriculum surveys, such as the Transfer Survey and End of Year survey can be used as input.<sup>4</sup>

Next to the curriculum surveys, three new types of meetings are organized. The goal, expected attendees and occurrence of these meetings are discussed further in this paragraph. If these meetings show that certain program components need to be improved, the program improvement plan is used, as described in paragraph 3.3 and Appendix F.

#### 4.2.1 Quarter meetings (new)

Every quarter there will be a Quarter meeting. The following people will attend this meeting: the responsible teacher and/or another member of the teacher team of the courses offered during the quarter, the Program Director and a selection of ESA-AP team members (Teacher Supporter, Academic Advisors and/or QA officer). The goal of this meeting is to stimulate alignment and share experiences between teachers of a specific quarter. Overarching themes and attention points will be addressed. Next to that, the ESA-AP team will be informed on how the courses are going, what issues may have arisen and what support is needed. The input from the focus groups, which every course ideally has (see paragraph 4.1.1), is very important for this meeting and will be addressed in this meeting by the teacher. The QA officer will also share the feedback from the STOOR councils as input for further improvement.

#### 4.2.2 Learning line meetings (new)

At the end of each quarter each learning line team within one academic year (in this case year 1) will meet to discuss consistency, coherence and content of the courses related to the curriculum learning lines. The learning lines in the new bachelor program Applied Physics are: theory Mathematics, theory Applied Physics, experimental Applied Physics skills, computational Applied Physics skills and Professional and Personal development (P&PD). In line with the ongoing development of the year-1 courses, the learning lines of theory Mathematics and theory Applied Physics will be combined in this meeting, as well as the learning lines of Computational/Experimental Applied Physics and Professional and Personal development (P&PD). The coordinators of the learning line as well as the teachers involved in these combined learning lines (within one academic year) will be present. The Program Director and the QA officer will also attend this meeting.

The teachers of the courses which have just finished, will take the lead in this meeting together with the coordinators. The teacher discusses how the course went, which issues occurred, the knowledge level of the students and what the teacher expects from the students at the end of the learning line. The goal

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<sup>4</sup> If the Quarter Surveys will be implemented, it is possible that the general curriculum surveys will be integrated into the Q Survey, instead of sending out a separate survey.

of this meeting is to achieve alignment between the different teachers within the learning lines and to monitor proper implementation of the learning objectives along an entire learning line.

#### 4.2.3 Curriculum meetings (new)

Next to the regular PC and EC meetings, there will be a Curriculum meeting to monitor and discuss the curriculum of the new bachelor program. These meetings take place every semester. One delegate per committee should be appointed to monitor the quality of the new bachelor's program on a curriculum level. The PC member focuses on the curriculum content and the EC member on the assessment. The QA officer, who is an advisor in both committees, is in the lead in organizing this meeting and will contact these delegates in advance to identify if and which data they need as input for discussion (e.g. results from the Transfer Survey or End-of-Year Survey). The Program Director and QA officer will also attend this meeting.

### 4.3 Final remark

As a final remark, we would like to emphasize that the quality assurance process as described above, is a rather new way of working intended to better monitor the quality of education, especially on a program level. Therefore, the Program Director and QA officer will closely monitor the progress of this novel process in quality assurance. If certain evaluation methods turn out to be inefficient and need improvement, e.g. in frequency or focus of the intended meetings, they will be carefully adjusted before or during the academic year. Potential adjustments in the QA process will obviously be discussed with the stakeholders involved.

## Appendix A. Example course overview

# 3XXX0: Example Course

YXQX BC AP 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.

low score (<3.0 on scale 1 to 5)

high score (>4.0 on scale 1 to 5)

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

## Evaluation survey

### Quantitative data

| Evaluation information | 2020-2021 | 2021-2022 | 2022-2023 |
|------------------------|-----------|-----------|-----------|
| n recipients           | 169       | 180       | 165       |
| n responses            | 33        | 36        | 26        |
| Response rate          | 20%       | 20%       | 16%       |

| Notes |
|-------|
|       |

| The course in general | 2020-2021 | 2021-2022 | 2022-2023 |
|-----------------------|-----------|-----------|-----------|
| Overall rating (1-10) | 7.4       | 7.3       | 6.9       |
| Set-up                | 3.7       | 3.9       | 3.6       |
| Organization          | 4.3       | 4.3       | 4.1       |
| Course material       | 3.5       | 3.6       | 3.8       |
| Assessment            | 4.3       | 3.9       | 3.8       |

|  |
|--|
|  |
|  |

| Studying for this course                      | 2020-2021 | 2021-2022 | 2022-2023 |
|---|-----------|-----------|-----------|
| 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%       |

|                             |
|-----------------------------|
| <i>Effort is quite low.</i> |
|                             |

| Teachers in this course | 2020-2021 | 2021-2022 | 2022-2023 |
|-------------------------|-----------|-----------|-----------|
| Dr. ir. A               | 3.7 / 3.9 | 4.0 / 4.3 | 3.6 / 3.8 |
| Dr. ir. B               | 3.8 / 3.8 | 3.7 / 4.0 | 4.1 / 4.3 |

|                       |
|-----------------------|
| Lecturer / instructor |
|                       |

| Course-specific questions  | 2020-2021 | 2021-2022 | 2022-2023 |
|--|-----------|-----------|-----------|
| The videos on Canvas were useful for understanding the concepts of the course. | 3.6       | 3.9       | 3.8       |

|  |
|--|
|  |
|  |

## Qualitative data

| <b>What did you like?</b>  | <b>21-22 count</b> | <b>22-23 count</b> |
|--|--------------------|--------------------|
| Fascinating topic / Interesting course material / Combination in topics                        | 5                  | 8                  |
| Matlab instructions  | -                  | 6                  |
| Very well organized  | 4                  | 5                  |
| The direct link to actual cases / Very well explained how it relates to real-life technologies | 3                  | 2                  |
| The Q&A's  | -                  | 2                  |

| <b>What would you like to improve?</b>                        | <b>21-22 count</b> | <b>22-23 count</b> |
|---|--------------------|--------------------|
| More exam practice possibilities / More practice exercises    | 3                  | 5                  |
| Lot of mathematical derivations                               | -                  | 3                  |
| The first part went very slow / information was already known | 2                  | 2                  |

## Pass rates

| <b>Final examination</b>      | <b>2020-2021</b> | <b>2021-2022</b> | <b>2022-2023</b> |
|-------------------------------|------------------|------------------|------------------|
| <i>n</i> students in course   | 169              | 180              | 165              |
| <i>n</i> made exam            | 137              | 125              | 132              |
| <i>n</i> exam grade >1        | 126              | 110              | 115              |
| <i>n</i> exam grade ≥5.5      | 90               | 83               | 85               |
| % pass all students           | 53%              | 46%              | 52%              |
| % pass students who made exam | 66%              | 66%              | 64%              |
| % pass students >1            | 71%              | 75%              | 74%              |
| Average grade >1              | 6.0              | 6.3              | 6.1              |

| <b>Notes</b>                                       |
|--|
| <i>Final examination was a written exam of 70%</i> |

| <b>Overall course pass rate</b>                            | <b>2020-2021</b> | <b>2021-2022</b> | <b>2022-2023</b> |
|--|------------------|------------------|------------------|
| <i>All students after attempt number</i>                   |                  |                  |                  |
| 1  | 53%              | 47%              | 54%              |
| 2  | 69%              | 65%              | 74%              |
| <i>Serious students (grade &gt;1) after attempt number</i> |                  |                  |                  |
| 1  | 67%              | 72%              | 69%              |
| 2  | 79%              | 84%              | 88%              |

|                                 |
|---------------------------------|
| <i>Final grade consists of:</i> |
| <i>- Exam 70%</i>               |
| <i>- Midterm 30%</i>            |

## Teacher's evaluation

| <b>Feedback provided to students</b>  |
|---|
| Thank you for the feedback! Speaking on behalf of the teacher team: overall we are pleased to see that one has learned and enjoyed from the course. There are two specific things to point out:   |
| <ul style="list-style-type: none"> <li>- The Matlab assignments/instructions were new this year. We are glad they were appreciated and next year we will continue with these instructions.</li> <li>- We will provide more practice material for the next round of the course.</li> </ul> |
|   |

| <b>Looking back</b>  |
|--|
| <b>Satisfied course?</b>   |
| Overall we were happy, but a bit disappointed with the low attendance by students.   |
| <b>Satisfied students' results?</b>  |
| The pass rate is in line with previous years. Many students who did not pass, did also not actively participate in the course. |
| <b>Satisfied students' evaluation?</b>   |

We are happy with the evaluation. The main improvement point is to provide more practice material for the exam. Besides, there are some personal preferences for the students in ways of teaching, but it is difficult to satisfy all. We think that we offer a good variety of teaching method. Topic-wise, students see the connection to real-life applications and appreciate that.

**Looking forward**

**Changes planned?**

No big changes. Some more practice material should be made available.

**Resources needed?**

We have to find a new TA for next year. The help with ANS Delft was excellent this year.

## Other input

**STOOR**

- The course is fine. It is nice that examples are shown in the course and that there is a direct link to real-life applications.
- The pace of the first part was not very high.
- The Matlab instructions were very helpful.
- The content of the midterm was very representative.
- More exercises would be nice.

## Appendix B. Stumbling-block courses question block

1. <Name course> is one of the courses in the Applied Physics 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 QA officer sets up and prepares a meeting with the responsible lecturer. A delegate from the PC or EC, the Program Director and/or the Teacher Supporter can also join this meeting if this is deemed desirable.
- 2) In the meeting, three topics will be discussed: 1) the past edition of the course/assessment and how the responsible lecturer looks back at it; 2) the plans for improvement; 3) the process of developing, implementing, and evaluating the improvement plan; and 4) what support is needed.
- 3) The responsible lecturer will write an improvement plan, using the Improvement Plan Format AP. The Teacher Supporter and/or QA officer provide assistance if needed.
- 4) The responsible lecturer sends the improvement plan to the QA officer who, together with the Teacher Supporter, performs 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, the QA officer will discuss this with the responsible lecturer.
- 5) If the improvement plan meets the basic criteria, as checked by the QA officer, the QA officer will send it to the committee who requested the improvement plan, as well as to the Teacher Supporter and Program Director.
- 6) The committee who requested the improvement plan will discuss the improvement plan in their meeting. The responsible lecturer will be invited to this meeting to elaborate on the plan and to answer questions from the committee. The committee either approve the plan or not. If they do not approve the plan – i.e. if they do not have faith that the proposed changes will lead to a better course – the committee advises the responsible lecturer on how to make the improvement plan better and will schedule when the improved improvement plan will be discussed.

### **PRE-COURSE YEAR B**

- 7) 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**

- 8) In the first weeks of the course, the evaluation preview for the upcoming student survey will be ready. In the improvement plan, the teacher has already proposed questions that will measure whether the suggested improvements are successful. Before sending the preview to the responsible lecturer, the QA officer lists these questions. The responsible lecturer can indicate whether these questions are adequate for the implemented improvements or if they need to be adapted.
- 9) The QA officer will closely monitor the course by – among other things – attending the STOOR councils. 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**

- 10) Once the course has ended, the QA officer will flag the course in the course evaluation overviews, so that it is immediately visible that this course had an improvement plan in the previous year. In the course evaluation overview, a section will be added that specifically addresses the evaluation of the improvements.
- 11) When the course evaluation overviews are discussed in the PC and the EC, or between the QA-Officer, Teacher Supporter and Program Director, 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 will be positively notified. If the improvements were not successful, additional action will be taken (i.e. more information will be gathered or a new improvement plan will be requested), and the process continues at the items listed at POST-COURSE YEAR A .

## Appendix D. Template course improvement plan

### Course Improvement Plan of the department of Applied Physics

#### **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?

#### **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 AP team can provide support.

## Appendix F. Template program improvement plan

### Program Improvement Plan Applied Physics

#### **Template**

*Topic/issue:*

*Program:*

*Academic year the improvements will be implemented:*

*Planned start of the implementation of the improvements (quarter or date):*

*Responsible person:*

*Version history:*

| Version | Date | Discussed by | Results/changes/status |
|---------|------|--------------|------------------------|
|         |      |              |                        |
|         |      |              |                        |
|         |      |              |                        |

#### **1. Reason for the improvement plan**

*What are the issues that are addressed in this improvement plan?*

*In which survey did these issues arise? If survey results were not the instigator of this improvement plan, what was?*

#### **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 we planning to achieve the goals? Make sure to address:*

- a) *What changes will be made?*
- b) *How/why do we 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) *When do we want to implement these changes?*
- 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 we plan to address these factors, if possible?*

#### **4. Evaluation of improvement plan**

- a) *How do we monitor the implementation of the improvements?*
- b) *How and when do we plan to evaluate if the improvements are successful?*
- c) *Please formulate some questions that can be added to an evaluation survey next year to check if the improvements were successful.*