ASSESSMENT PROTOCOL GRADUATION PROJECT MSc APPLIED PHYSICS (version September 2023)

This protocol replaces the protocol Graduation Project MSc Applied Physics 2022-2023

The assessment of a Graduation Project Applied Physics comprises the following aspects:

(1) **Project duration:** regulations regarding finalizing the project
(2) **Graduation committee**: composing a three-member committee along the guidelines
(3) **Graduation committee meeting**: presentation and defense, evaluation afterwards
(4) **Assessment procedure & rubrics, form**: determination and communication of the grades

1. **Project duration.** In the Graduation Project registration form, the student after discussion with the responsible Applied Physics supervisor (also first TU/e examiner) fills in the agreed end date, based on 1260 hrs (45EC) / 1680 hrs (60EC), and the extended end date, that is the agreed end date + allowed extra time, based on adding 160 hrs (equivalent to 4 full-time working week (45EC project)), or 240 hrs (equivalent to 6 full-time working weeks (60EC project)). For both dates (public) holidays should be considered. If by the agreed end date including allowed extra time the report is insufficient or the report, presentation and defense are not delivered, the student receives an insufficient final grade (NVD). This grade will be communicated to CSA by the first TU/e examiner and will be administered in Osiris. The student has the opportunity for a retake, for a limited time of 480 hrs (equivalent to 12 full-time working weeks). If by the end date of the retake the report is insufficient or the report, presentation and defense are not delivered, the student fails the Graduation Project (NVD). In general, a new project should be started. If special circumstances play a role, a customized route should be followed. See the study guide for more information.

2. **Graduation committee.** The graduation committee consists of at least 3 TU/e examiners (4 examiners are allowed in consultation with student); MEMBER 1 is the responsible Applied Physics supervisor, also TU/e examiner, and chair. MEMBER 2/3 are two TU/e examiners at least at assistant professor level. MEMBER 2 is an examiner not belonging to the track (FBSM, PB, NQP) of the responsible Applied Physics supervisor (first TU/e examiner). If MEMBER 2 is not from the Applied Physics department, MEMBER 3 must be an examiner from the Applied Physics department. Optional MEMBER 4 is an examiner from TU/e or another university. Experts and daily supervisors (e.g. company supervisor, PhD, postdoc) may act as advisors and can be consulted by the first TU/e examiner. Please note the additional requirements for the graduation committee for the acknowledgements ''Theory for Technology'' and ''Quantum Technology'' here.

3. **Graduation committee meeting.** The committee meeting consists of three elements: presentation, defense, evaluation. The student sends the report and the signed TU/e Code of Scientific Conduct for the Master's thesis at least 10 working days before the graduation committee meeting to the graduation committee members. At the meeting, the student delivers a presentation of approx. 20 minutes followed by a discussion of approx. 10 minutes Thereafter, in a meeting with the student and committee only, the defense takes place lasting at most 1 hour. At the end, the evaluation takes places within the committee.

4. **Assessment procedure & rubrics.** The assessment has 4 components, A. Report (30%), B. Presentation (20%), C. Defense (20%), D. Implementation of the work itself (30%). All examiners in the graduation committee use the rubrics to determine the grade of each component. Before the meeting, the first TU/e examiner has determined the grade for implementation of the work itself (D); consultation with other (daily) supervisors is recommended. At the start of the evaluation, all examiners should individually determine their grades for components (A-C). After the discussion, the grades for the 4 components are decided on a scale of 0 to 10, in 1 decimal. The final grade is the weighted average, rounded to the nearest 1/2 grade. When rounding is ambiguous, the majority decides. The student passes when the final grade is ≥ 6.0, and the Report, Presentation, and Implementation of the work itself are at least graded with a 6.0. After the defense and evaluation, the first TU/e examiner explains and motivates the grades to the students within the committee meeting. This will be documented on the assessment form (see below)

Assessment form. The grades of the 4 components and final grade should be registered on the assessment form. The first TU/e examiner includes an elaborate written motivation per component, based on the discussions and input of the other committee members. In case the final grade is 6.0 or 10.0, a separate motivation should be given. The first TU/e examiner sends the report, the signed TU/e code of scientific conduct for the master's thesis form, the completed assessment form + motivation to the student, CSA, as well as to the other committee members, within 5 working days after the graduation committee meeting. The grades will be processed by CSA in Osiris. If the student doesn't meet the requirements for passing (see above), the student fails the Graduation Project and the same procedure as described before (sending completed assessment form to CSA, student and other committee members, grades in Osiris) applies. The student will enter a retake procedure; see the study guide for more information.

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1. Surname student + initials:
2. Student ID number:
3. Date of assessment:
4. Start date Graduation Project:
5. Expected end date *(as indicated on the registration form):*
6. Expected end date incl. allowed extra time *(as indicated on the registration form):*
7. Course code and corresponding study load: <select course code>
8. Name of Masters' program, track: <select track>
9. Capacity group / research unit: <select group>
10. Title Graduation Project:

11. Committee members + advisors:

COMMITTEE MEMBERS		
NAME EXAMINER + CAP. GROUP. + DPT	ROLE	TU/e (Y/N)
1.	Responsible AP supervisor, chair	Y
2.	outside track	Y
3.	If 2 not from AP, in AP dept.	Y
4.		
ADVISORS	ROLE	AFFILIATION
1.		
2.		

12. Grades (components in 1 decimal, final grade 1/2 integer):

Report (30%)	Presentation (20%)	Defense (20%)	Implementation (30%)	FINAL GRADE*

* If one or more of the 3 components (Report, Presentation, Implementation) are graded <6.0, the final grade will be NVD.

13. Additional requirements:

☐ Motivation 4 components included on separate sheets (approx. 5 sentences / component); optional additional motivation for final grade (compulsory when grade is 6.0 or 10.0).

☐ Components Report, Presentation & Implementation of the work itself are ≥ 6.0

☐ Composition graduation committee according to the guidelines

☐ Title page Report according to the guidelines (see study guide)

☐ Project in accordance with TU/e Code of Scientific Conduct for the Master's thesis

☐ The content of the project, composition of the committee and assessment form in accordance with the requirements for the acknowledgment (only if applicable) <select acknowledgement>

☐ Check on report has been conducted by first TU/e examiner via Ouriginal or manually in case of confidential report

Confidentiality (see guidelines Graduate School and the study guide Graduation Project AP for more information):

- ☐ Open access (not confidential)
- ☐ Temporary embargo of 2 years, including public summary.
- ☐ Embargo of 2-5 years, including public version. A request from the company must be submitted to the Dean AP at least two weeks before the graduation meeting takes place.

Date of publication after confidentiality period:

☐ Report, completed assessment form + motivation (pdf) sent by first TU/e examiner to CSA, student, committee members

Signature of the first TU/e examiner

Date of signature

ASSESSMENT FORM GRADUATION PROJECT MSc APPLIED PHYSICS (version September 2023)

To be filled in by the first TU/e examiner. Feedback of the additional committee members on the components is incorporated. Motivation on the 4 components included (approx. > 5 sentences / component). Additional motivation for final grade is compulsory when final grade is 6.0 or10.0). In case students would like to obtain the ''Theory for Technology'' or ''Quantum Technology'' acknowledgement, explicitly capture this in the feedback.

Feedback on Report (30%)

Feedback on Presentation (20%)

Feedback on Defense (20%)

Feedback on Implementation of the work itself (30%)

Additional motivation (compulsory for grade 6.0 or 10.0)

APPENDIX 1. RUBRICS GRADUATION PROJECT MSc APPLIED PHYSICS

A. REPORT (30%) All at level 1 = 4, 2 = 6, 3 = 8, 4 = 10	**Level 1 – Insufficient (4)**	**Level 2 – Sufficient (6)**	**Level 3 – Good (8)** **Criteria on top of Level 2**	**Level 4 – Excellent (10)** **Criteria on top of Level 3**
1a. Introduction of research question and methods	Student is not able to meet level 2 requirements	A basic overview of the current state of knowledge leads to a valid research question in a logical fashion.	A comprehensive overview of the state of knowledge is provided, which leads naturally to a valid research question with anticipated answers.	A complete, concise overview of relevant state-of-the-art research is provided.
		The used methods and analyses are sufficiently described.	The information about the methodology, research and/or design is set-up in such a way that replication of the study is possible.	Original/creative analyses and research methods are proposed and applied by the student.
1b. Results & conclusion(s)	Student is not able to meet level 2 requirements	The text contains plausible and valid interpretations of the data, measurements or models/calculations, leading to answers to the research questions, hypotheses.	Clear links to the research questions and/or hypotheses, including the introduction, are made.	Results are put into a broad perspective, with unresolved and/or new arisen problems that should be further examined.
		Results and analysis of data are shown via formulas, figures and tables to support the discussed and explained results of the research.	Student structures and handles results/data logically and carefully, and critically confronts research results to existing literature.	The full analysis of all data and results is perfectly documented and creatively illustrated, clearly and critically referring to earlier work and current developments.
		The conclusions are logically substantiated by the results and are clearly formulated.	In the conclusions and outlook, the student identifies the impact of the research and its societal impact.	The student is able to extensively describe the broad scientific and societal implications, including limitations of the research, taking into account strengths and weaknesses.
1c. Structure, style	Student is not able to meet level 2 requirements	The report is organized.	The report is logically connected and organized to the reader, with a functional layout and data presentation.	The report is well-structured with an excellent overall layout: the reader can identify the clear and unique function of each section.
		Language is precise and correct.	Language is concise and the student uses logical argumentation.	Language is precise, correct, and on excellent scientific level.

B. PRESENTATION (20%) **All at level 1 = 4, 2 = 6, 3 = 8, 4 = 10**	**Level 1 – Insufficient (4)**	**Level 2 – Sufficient (6)**	**Level 3 – Good (8)** **Criteria on top of Level 2**	**Level 4 – Excellent (10)** **Criteria on top of Level 3**
2a. Content and structure	Student is not able to meet level 2 requirements	The student introduces the content and purpose of the research project.	The student introduces and explains the research content and purpose of the research project in a logical way, such that the relevance/motivation of the project is a natural extension.	The opening, introduction and actual motivation of the presentation contain unique, exceptionally strong and creative elements.
		The student points out the relevance of the research project.	The student provides an accurate and complete explanation of key concepts and theories.	The student points out and explains the strengths and weaknesses of (the outcomes) of the research projects.
		The student delivers a structured presentation in a logical sequence.	The student provides a well-structured and organized presentation and is able to limit the presentation to the essential elements for addressing the key results.	The student provides a consistent narrative structure supported by clear, scientifically accurate and concise explanations.
2b. Performance	Student is not able to meet level 2 requirements	The level of the presentation fits the target audience, viz.the graduation committee members.	The student manages to keep the overall attention of the targeted audience.	The student keeps the targeted audience continuously engaged and involved.
		The used visual aids help the audience to follow the storyline.	The student uses visual aids that accurately support the message (e.g. key words on slides, strong visualizations, no abundant information)	Visual aids that captivate the audience are carefully and successfully applied throughout the presentation.
		The personal performance of the student sufficiently helps the audience to appreciate the outcome of the project.	The student appears comfortable and has a professional and engaging presentation style.	The student appears fully confident while presenting, with a presentation style that strongly adds to the liveliness and impact of the presentation.

C. ORAL DEFENSE (20%) **All at level 1 = 4, 2 = 6, 3 = 8, 4 = 10**	**Level 1 – Insufficient**	**Level 2 – Sufficient (6)**	**Level 3 – Good (8)** **Criteria on top of Level 2**	**Level 4 – Excellent (10)** **Criteria on top of Level 3**
3a. Defense of the thesis	Student is not able to meet level 2 requirements	The student is able to basically discuss and explain the most relevant elements of the thesis.	The student is able to defend the entire thesis, the choices done in the work and to indicate/argument possible weak points and improvements.	The student is able to build on the knowledge from the thesis and expand it to topics that are not directly related to the thesis.
		The student mostly masters the contents of what is written, but for a limited number of items is not able to explain background and scientific content related to the work.	The student is able to give an informed view on questions directly related to the thesis and its applications.	The student is able to answer all scientific questions related to his/her thesis as well as regarding its societal context.
3b. Knowledge of the study domain	Student is not able to meet level 2 requirements	The student can basically reproduce the relevant subject matter of the thesis on a textbook level.	The student shows understanding of the subjects discussed in the thesis.	The student has mastered all subjects discussed in the thesis
		Understanding of the implications of this subject matter on the topic of the thesis is sometimes lacking.	The student is aware of some of the current discussions in the literature related to the thesis topic.	The student is aware of discussions in the literature beyond (but related to) the topic of the thesis.

D. IMPLEMENTATION OF THE WORK ITSELF (30%) **All at level 1 = 4, 2 = 6, 3 = 8, 4 = 10**	**Level 1 – Insufficient (4)**	**Level 2 – Sufficient (6)**	**Level 3 – Good (8)** **Criteria on top of Level 2**	**Level 4 – Excellent (10)** **Criteria on top of Level 3**
4a. Scientific independence and creativity (45/60 EC)	Student is not able to meet level 2 requirements	*Supervisor-regulated approach* The fundamental elements of the research project are mostly introduced by the supervisor.	*Co-regulated approach* The fundamental elements of the research project are introduced in co-creation.	*Self-regulated learning approach* The student proposes the fundamental elements and direction of the research project, rather than the supervisor.
		The student has a hesitant attitude towards the research process.	The student has the correct, critical attitude towards most of the findings within the project.	The student has the correct, critical attitude towards the findings within the project, and the feedback of the supervisor.
		45 EC: Student has fulfilled the basic parts of the project to finish the assignment. 60 EC: Student has put the extra time (15EC) to good use to have a self-initiated contribution to the project.	45 EC: Part of the work can be identified to originate from the student's creative ideas. 60 EC: The direction of the research is augmented/guided by insights of the student.	45 EC: The student is in the lead in choosing the steps taken in the project. 60 EC: The student is in the lead in choosing the steps taken in the project, contributing creatively towards new approaches.
4b. Planning and communication	Student is not able to meet level 2 requirements	Student needs direction in project planning, but is able to make progress once guided. The student is basically able to follow the agreed planning. Interim goals are partially met.	Student plans ahead in the project and manages to meet short-term goals and deliver interim products. The student is able to stick to the project planning and timing.	The student is actively planning important milestones during the project and sets individual goals, monitors, regulates and controls the process of carrying out the project.
		The student is not proactive in communicating the progress.	The student communicates the progress of the project work and reflects on individual ideas within the working environment.	The student communicates the progress of the work and reflects on the individual ideas within the working environment. Seeks input when needed.
4c. Impact and extent of the work (45/60 EC)	Student is not able to meet level 2 requirements	45/60 EC: The progress in this project is a small incremental step for the supervisor.	45 EC: The project entails progress in the field. 60 EC: The project entails progress in the field; results can be considered for publication in a scientific journal, a presentation at a conference or as a part of an innovative prototype, design or patent application.	45 EC: like 60 EC level 3 60 EC: The project entails significant progress in the field; results will be published in a scientific journal, or they will be the basis for an innovative and viable prototype, design or patent application.