ASSESSMENT PROTOCOL GRADUATION PROJECT MSC STNF (version September 2024)

This protocol replaces the protocol Graduation Project MSc STNF 2023-2024 for students starting their GP on or after September 1, 2024

The assessment of a Graduation Project Science & Technology of Nuclear Fusion (STNF) comprises the following aspects:

(1) **Project duration**: regulations regarding the duration and finalization of 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, assessment form**: determination and communication of the grades,
(5) **Double diploma protocol**: differences in assessment rules regarding double (or more) diploma projects.

1. Project duration. On the Graduation Project registration form, the student, after discussion with the 1st TU/e examiner (also responsible STNF supervisor) fills in the agreed end date, based on 1260 hours (45EC), and the extended end date, that is the agreed end date + allowed extra time, based on adding 160 hours (equivalent to 4 full-time working weeks). For both dates (public) holidays should be considered. If by the agreed end date including allowed extra time the pass criteria are not satisfied (see *4. Assessment procedure & rubrics*) or the report, presentation and/or defense are not delivered, the student receives the final grade "Not met requirements" (NMR) – in Dutch: "Niet voldaan" (NVD). This grade will be communicated to CSA by the 1st TU/e examiner and will be administered in Osiris. The student has the opportunity for a retake, for a limited time of 480 hours (equivalent to 12 full-time working weeks). If by the end date of the retake the pass criteria are still not fulfilled or the report, presentation and/or defense are not delivered, the student fails the Graduation Project (NMR). 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 1st TU/e examiner, and chair. MEMBER 2/3 are two other TU/e examiners at least at assistant professor level. Optional MEMBER 4 is an examiner from TU/e or another university. The examiners in the graduation committee represent at least two of the three departments Applied Physics and Science Education, Mechanical Engineering and Electrical Engineering. Experts and daily supervisors (e.g., company supervisor, PhD, postdoc) may act as advisors and can be consulted by the 1st TU/e examiner.

3. Graduation committee meeting. The committee meeting consists of three elements: presentation, defense, evaluation. The student sends the abstract, report, science communication product (SCP) 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 committee members. At the meeting, the student delivers a presentation of 15 minutes followed by a discussion of approximately 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 place within the committee.

4. Assessment procedure & rubrics. The assessment has 5 components: (A) Report (25%), (B) Presentation (12.5%), (C) Science communication product (12.5%), (D) Defense (25%), and (E) Implementation of the work itself (25%). All examiners in the graduation committee use the rubrics to determine the grade of each component. Before the meeting, the 1st TU/e examiner has determined the grade for implementation of the work itself (E), in consultation with other (daily) supervisors. At the start of the evaluation, all examiners should individually determine their grades for components (A-D). After the discussion, the grades for the 5 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 components (A), (B), (C) and (E) are at least graded with a 6.0. After the defense and evaluation, the 1st TU/e examiner explains and motivates the grades to the students within the committee meeting. This will be documented on the assessment form. The graduation committee can unanimously

deviate from the rubric outcome by at most one point. The graduation committee must then provide a written explanation on the assessment form.

Assessment form. The grades of the 5 components and final grade should be registered on the assessment form. The 1st 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 1st TU/e examiner is responsible for sending the report, SCP, the signed TU/e code of scientific conduct and the completed assessment form (including 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 does not 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 above).

5. Double diploma protocol

Project definition and duration. In a double diploma, the student has two possibilities for a graduation project: (1) do two separate projects (one for each degree program) or (2) do a combined project (specially designed, with a study load according to the PERs). In these two cases, the assessment completely follows the assessment protocols of the degree program. Always check the other degree program's regulations as well. When doing a combined project, the allowed extra time and retake procedure depends on the specific programs: for NF-AP the extra time is 240 hours (based on 6 full-time working weeks) and the retake procedure and duration the same as above. For other combinations of degree programs, contact the respective academic advisors.

Graduation committee. For possibility (1), two graduation committees are formed, one for each degree program, satisfying the requirements of the respective degree programs. For possibility (2) of a combined project, in general, two different supervisors (the 1st TU/e examiners) are appointed representing the different areas of expertise of the degree programs. These are the MEMBER 1's and chairs of the graduation committees. If there is only one supervisor, they fill the role of MEMBER 1 and chair of both graduation committees. MEMBER 2-4 are allowed to overlap between the two graduation committees, but MEMBER 1 of one of the graduation committees can never take the role of MEMBER 2-4 in the other graduation committee. Possible further restrictions are specified in the regulations of the respective degree programs.

Graduation committee meeting. For possibility (1), there will be two separate graduation committee meetings. For possibility (2) of a combined project, a single graduation committee meeting is held consisting of one presentation and one defense, each taking the same amount of time as a single degree graduation project of matching study load. The exact duration can vary between degree programs and should be made clear to the student in advance.

Assessment procedure. For both possibilities (1) and (2), the project(s) is (are) concluded with two final grades, one assessment per degree program. The grading and corresponding communication follows the assessment procedures and rubrics of the respective degree programs.

For more information, see Education guide STNF: Combined master's program.

ASSESSMENT FORM GRADUATION PROJECT MSC STNF (version September 2024)

For students starting their GP after September 1, 2024.

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 including allowed extra time:
7. Course code and corresponding study load: <select course code>
8. Name of Masters' program: <select program>
9. Title Graduation Project:
10. Committee members + advisors:

COMMITTEE MEMBERS		
NAME EXAMINER + CAPACITY GROUP + DEPARTMENT	ROLE	AFFILIATION
1.	Supervisor, 1st TU/e examiner, chair	TU/e
2.		TU/e
3.		TU/e
4.		
ADVISORS	ROLE	AFFILIATION
1.		
2.		

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

Report (25%)	Presentation (12.5%)	SCP (12.5%)	Defense (25%)	Implementation (25%)	FINAL GRADE*

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

12. Additional requirements:

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

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

☐ Composition graduation committee according to the guidelines.

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

☐ Project in accordance with TU/e code of scientific conduct for the master's thesis.

☐ Fraud and plagiarism check on report and SCP (if possible) has been conducted (1st TU/e examiner is responsible) via Ouriginal or manually in case of confidential report.

Confidentiality (see guidelines Graduate School and the education guide 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, Abstract, SCP, the signed TU/e code of scientific conduct and completed assessment form + motivation (pdf) sent by 1st TU/e examiner to CSA, student, committee members.

Signature of the 1st TU/e examiner

Date of signature

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To be filled in by the 1st TU/e examiner. Feedback of the additional committee members on the components is incorporated. Motivation on the 5 components included (approximately 5 sentences / component). Additional motivation for final grade is compulsory when final grade is 6.0 or 10.0 or when the graduation committee unanimously deviates from the rubric outcome by at most one point.

Feedback on Report (30%)

Feedback on Presentation and Science communication product (12.5% + 12.5%)

Feedback on Defense (25%)

Feedback on Implementation of the work itself (25%)

Additional motivation (compulsory for final grade 6.0 or 10.0 or when the graduation committee unanimously deviates from the rubric outcome by at most one point)

APPENDIX 1. RUBRICS GRADUATION PROJECT MSC STNF*

A. Report	Items considered	6 (sufficient)	10 (excellent)
Scientific quality	Context of the work.	Being able to describe motivation for the work.	Placing the work in context of, critical review of own work and results, helicopter view, outlook.
	Scientific reasoning.	Scientific reasoning is free of errors.	Soundness of scientific reasoning. Separation of results (measurements, results from modelling, theoretical results) from interpretation.
	Theoretical treatment.	In theoretical work: being able to reproduce / summarize derivation from literature, describing assumptions and defining parameters.	In theoretical work: rigor.
	Description experimental setup (if applicable) and treatment of data.	In experimental work: Description of the experiment and setup, plotting results in figures.	In experimental work: Treatment of errors – error estimation, error breakdown, error bars in figures. And adequate description of the experiment.
	Model description/assumptions/ validation.	In modelling/computational research: model description and discussion on validity of results.	In modelling/computational research: model description and assumptions, implementation, validation.
	Separation own vs existing results.	Compare own results with what is found by others.	Clear separation of own work from existing knowledge.
	Discussion relevant literature.	Being able to find the and cite leading papers in the field.	Critical discussion of relevant literature.
	Evaluation of own work.	Add discussion section/paragraph in report.	Critical evaluation of own work.
Reporting quality	Information in report: what is done, why is it done, how is it done. What is the result?	The report should at least have a motivation and research question (or design goal), and it should describe the method, give results and end with a conclusion.	The report tells the reader exactly what was done, why it was done, how it was done, and what the result was.
	Structure of the report.	The basic structure has as minimum component the items listed below.	Overall structure of the report is adequate and logical.
	Completeness of report: o Abstract.	The report contains the following parts: o Abstract gives at least aim and result.	The report contains the following parts: o Abstract: informative and concise on aim and results.
	o Introduction.	o Introduction containing background, motivation, problem statement and description of the approach.	o Introduction: background, motivation, problem statement breakdown of the problem, clear description of the approach. Adequate review of relevant literature.
	o Theory (when applicable).	o Summary of theory or background knowledge used in the rest of the report.	o Theory (when applicable): describing existing knowledge and building further on that.
	o Method/experiment.	o Description of method/experiment.	o Method/Experiment: clear description of experiments or methods, including the motivation what is to be learned from each experiment.
	o Results.	o Results.	o Results: clear presentation of results.
	o Interpretation.		o Interpretation: description and discussion of what can be learned from the results.
	o Summary and discussion.	o Summary and discussion.	o Summary and Discussion (if applicable: application potential).
	o Conclusion.		o Conclusion: relate back to the research question/problem.
	Use of figures.	Figures contain main results/information and have captions.	Figures are adequate to the point and well chosen.
	Conciseness.		Not too much, not too little.

B. Presentation	Items considered	6 (sufficient)	10 (excellent)
	Clarity and structure.	Logical structure: problem definition, method, results, conclusion.	Overall clarity, clear story line, logical structure.
	Scientific argumentation, leading to conclusions.	No inconsistencies in argumentation.	Convincing scientific argumentation, leading to conclusions that are supported by the evidence presented.
	Scientific substance.	Scientific substance: presentation of results that can be verified.	While focusing on the story line, still giving sufficient scientific substance. Conveying that every statement is based on research and can be backed up with more evidence or literature if asked.
	Adequate introduction.	In introduction motivation and problem definition is addressed.	Adequate introduction, i.e., not too short but efficiently getting to the point.
	Balance between introduction, exposition of the work itself, conclusions, and discussion/ reflection.	Introduction, results, conclusion, and discussion are all addressed.	Good balance between introduction, exposition of the work itself, conclusions, and discussion/reflection.
	Selection of the results.	Present results relevant for problem.	Good selection of the essential results that underpin the conclusions.
	Convincingness.	Student makes clear he stands behind his conclusion.	That the student manages to convince that this is good work, both in terms of enthusiasm but also scientific explanation.
	Handling of the questions in the discussion.	Student is able to answer question directly related to his own work, on how he has done it	Handling of the questions in the discussion.
	Timing of the presentation.	Within 20 % of the allocated time.	Within the time constraints.
C. SCP	Items considered	6 (sufficient)	10 (excellent)
	Is it clear what the message is?	There is a message, but it is not very clear and/or mixed with other messages.	The SPC is suitable for the indicated target group.
	Does it address the selected audience?	Some consideration to the intended audience is given, but this is not used effectively.	
	Is the chosen form effective, fitting?	The form is in itself OK, but not particularly suitable for the purpose.	
	If graphics are used, are they right for the purpose and audience: do they support the message effectively and are they attractive?	The graphics meet the minimum technical requirements but are not effective in supporting the message.	
	Is it original, imaginative? In form, content (original arguments), or both.	The form is not particularly original in any way.	
	Does it effectively deliver the message to the intended audience?	The sum of the above: form, graphics, and presentation are each acceptable but do not effectively work together to deliver a message.	The SPC has a clear line and message. The SPC makes a compelling reading.

D. Defense	Items considered	6 (sufficient)	10 (excellent)
	Mastery of the thesis research.	Able to discuss the items of direct relevance to the project. On how the student performed the work.	Showing good mastery of all aspects of the thesis research, ability to defend all parts of the research.
	Ability to engage in a scientific debate.	Being able to defend the main conclusion of the report.	Ability to engage in a scientific debate, standing one's ground when challenged, conceding when not knowing something.
	Ability to perform scientific reasoning on the spot.	Ability to give a scientific reasoning involving the main aspects of the work.	Ability to think on one's feet when confronted with a new idea or fact, integrate it in the discussion of the work; ability to perform scientific reasoning on the spot.
	Ability to discuss the place of the research project.	Being aware of how the project fits in the bigger picture of the research field.	Ability to discuss the place of the research project in the larger frame, its impact and potential.
	Level of (fusion-relevant) scientific knowledge in a broader sense.	Can reproduce the basics of the fusion canon.	Has a general (fusion-relevant) scientific knowledge in a broader sense.

E. Implementation	Items considered	6 (sufficient)	10 (excellent)
Scientific approach and level	Depth and breadth/scope/ground covered.	The student knows the basics of the specific topic his project is about.	Large Depth and Breadth/scope/ground covered. (It is really the combination that matters.)
	Ability to come to an articulation of the research question (based on literature).	The student can define a research question based on the project task.	Clear articulation of the research question (based on literature).
	Scientific level achieved.	The work is free of basic errors, and the conclusion is supported by the results presented.	High Scientific level achieved, of PhD quality.
	Critical attitude, independence.	The student has a critical attitude towards its own results and conclusions (by discussing the validity and reliability).	(Justified) critical attitude to literature and own results; Independence in the formation of scientific ideas.
Creativity and initiative	Originality: of the problem, the method.	Originality: the student follows the Supervisors advise and, in a few instances, demonstrates that he can add new insights.	Originality: of the problem, the method.
	Initiative, self-propelled.	Demonstrated some initiative, needs sometimes help but can also work individually.	Demonstrated lots of initiative, was self-propelled.
	Accuracy: verification/validation of each result, calculation, computational step?	Basic errors are absent, but some smaller errors are apparent. Validation and verification have sometimes been done, but not in a systematic way.	Demonstrated large accuracy: verification/validation of the results, correct calculations, explained computational steps.
	Ability to work independently.	Needs guidance most of the time, but for some aspects can work independently.	Worked mostly independently, but also made efficient use of guidance.
	Ability to find experts and information.	When things do not work out and student is advised to check with other experts or in literature, able to improve answers.	Found the relevant experts or expertise and did not try to find out everything on one's own.
Project execution and skills	Project management, speed, and planning.	Planning is not delayed more than 25 %, planning contains the main aspects, project management is done in collaboration with supervisor.	Good project management: project finished on time, no delays.
	Reliability: whether student delivers something timely if promised.	The student delivers if promised but needs to be remembered several times.	Reliability, i.e., the student delivers if promised, and timely).
	In the reporting, was the iteration process efficient?	Several iterations needed before an acceptable result is obtained.	In the reporting: the iteration process is efficient, only 1 iteration needed.
	Processing of feedback.	Feedback is taken note of, but not always processed (in the intended way).	The student took note of feedback and used this efficiently.
	Collaborative skills/ when appropriate: ability to work in a team.	Student does his part in the team, but will not initiate collaborations him/herself, not active to promote teamwork, but does also not frustrate teamwork.	Good Collaborative skills, team player.
	Development of relevant skills: programming, experimental skills, data analysis, …	Has basic skills but does not demonstrate any special skills or skill developed to a higher level.	Demonstrates some special skills, at a higher level than the average student.

* ≤ 5 = fail, 6 = sufficient, 7 = satisfactory, 8 = good, 9 = very good, 10 = excellent