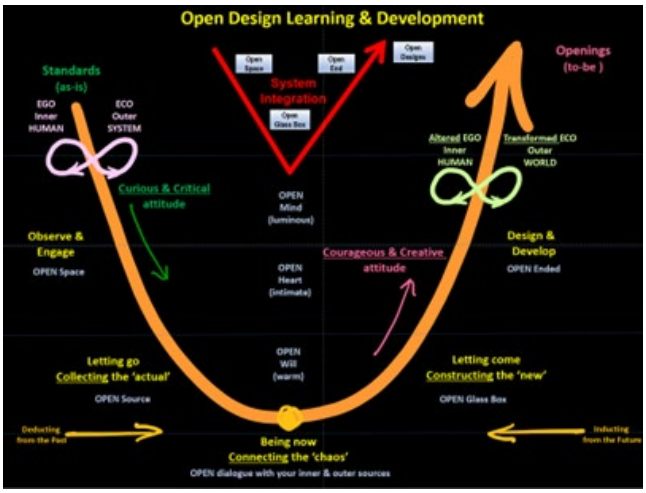
SYLLABUS - MSC GRADUATION GUIDELINE FOR ENGINEERING AND SYSTEMS STUDENTS



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Version June 2022

It is mandatory that you plan an appointment with the graduation coordinator E&S to officially start your graduation process, before you have arranged a graduation place at a company or any other organisation.

1. INTRODUCTION

This document describes the MSc graduation process within the graduation direction Engineering & Systems[1] (further in this document abbreviated as E&S). The formal processes and procedures are defined in official regulations:

- Teaching and Examination Rules (TER) 4TU MSc CME,
- Rules and Guidelines Board of Examiners (RGBE) 4TU MSc CME.

There are two formal course codes for the entire MSc graduation process: CME5100 for the kick-off presentation and the graduation proposal and CME5200 for the execution of the graduation work, incl. the final results/presentation and the defence. CME5100 is finished after approval of the graduation proposal (GP) and a successful kick-off meeting. CME5200 is finished after a successful defence and presentation of the results of the MSc thesis. The student will get one overall grade for both CME5100/5200. The commendation of the student's MSc work will be based on the following criteria:

- Connect - learning process and user satisfaction (courage, curious, creative, client)
- Construct - model compilation, solutions and verification (conception, conversion, correctness)
- Conclude - development results, validation & reflection (conspection, cyclical, completeness)
- Convince - defencing the work (cogent & critical)
- Convey - reporting and presenting the work (clear & care)

The Graduation Process

The Engineering & Systems group focuses on engineering development problem solving using a systems thinking approach. The figure on the final page of this document shows the related development cycle (note that this figure has already been used in the course CME5030, formerly CIE4030, on methods for research and development). This will form the basis for your MSc thesis work.

From start to kick-off meeting

From this development cycle, and related Open Design Learning principles, we require the student to answer the following 7 questions in a Graduation Project proposal document ensuring a successful kick-off meeting:

1. *Curiosity* – Why/how are you specifically **connected** with your research and development problem of interest and why/how does it drive you?
2. *Courage* - What is your **development gap** that relates to the context of your problem of interest, which artefact will be created/improved (your response) and why is this scientifically/operationally relevant?
3. *Constructive* - What does your **needs-analysis** look like and how did you compile it?
4. *Creativity* - How are you going to **solve** your problem of interest, by means of which **method** and **demonstrate your preliminary response** (rapid-prototype: simulation model (logical, mathematical), experimental real-life setup (organizational, digital))?
5. *Conclusive* - What is your **verification & validation approach** demonstrating how your final response will be evaluated?
6. *Clarity* – What are your **specific (sub)steps towards the final response**, how are you going to execute these and how have you planned these over time?
7. *Conveyance* - How are you going **to communicate and externalize** your project?

[1] This graduation reader can also be used for MSc projects of the masters CIE/ODE in accordance with their respective TER regulations.

The before mentioned steps are explained in the figure on the final page of this document.
When you have compiled your **preliminary** Graduation Project proposal (e.g. a max. 2 A4 pages document) answering all the above 7 questions you can approach the EAM Graduation Coordinator. For this purpose, **weekly consultation meetings** are scheduled where you can (virtually) walk by **every Monday afternoon (14:00-17:00)**.

As soon as the **preliminary** Graduation Proposal is of high enough quality the graduation coordinator will advise you to set up a kick-off meeting with at least a Graduation Chairman and a first supervisor to go over your **final Graduation proposal** (e.g. a max. 10 A4 pages document) **and your preliminary response** (e.g. prototype)**.** When this has been approved by them, you have successfully passed the kick-off (CME2001) and you can continue working on your Graduation Project (CME2000).

NOTE: we do not already require a second supervisor at the moment of the kick-off meeting but before the midterm the second supervisor should be added to your graduation committee to make it complete.

NOTE: your assignments for CME5030 (formerly CIE4030) course can not be reused for Graduation Proposal. These assignments are only training works to prepare you for this.

From kick-off to midterm to greenlight meeting

After the Graduation Proposal has been approved, the student can start to execute the work that has been proposed.
At least one **midterm meeting** is required between kick-off and greenlight. The midterm meeting requires the MSc student to demonstrate the committee members what has been achieved with regards to answering questions 3 to 5 (the so-called deltas). Discuss with your committee the specific required intermediate response. The goal is to convince the committee that the achievements (deltas) are sufficient to **successfully continue and finalize** the MSc graduation project.

NOTE: it is not required to have a midterm report.

The goal of the **greenlight meeting** is to assess whether the MSc student is ready to graduate, to present and defend the main graduation results and conclusions. For this meeting, a 95% **complete** version of the final thesis response must be submitted. Student will get feedback on the thesis response. The student is also required to only demonstrate what has been achieved in relation to the greenlight meeting (deltas compared to midterm). If successful, the work is approved and the student can proceed towards the final presentation and defence.

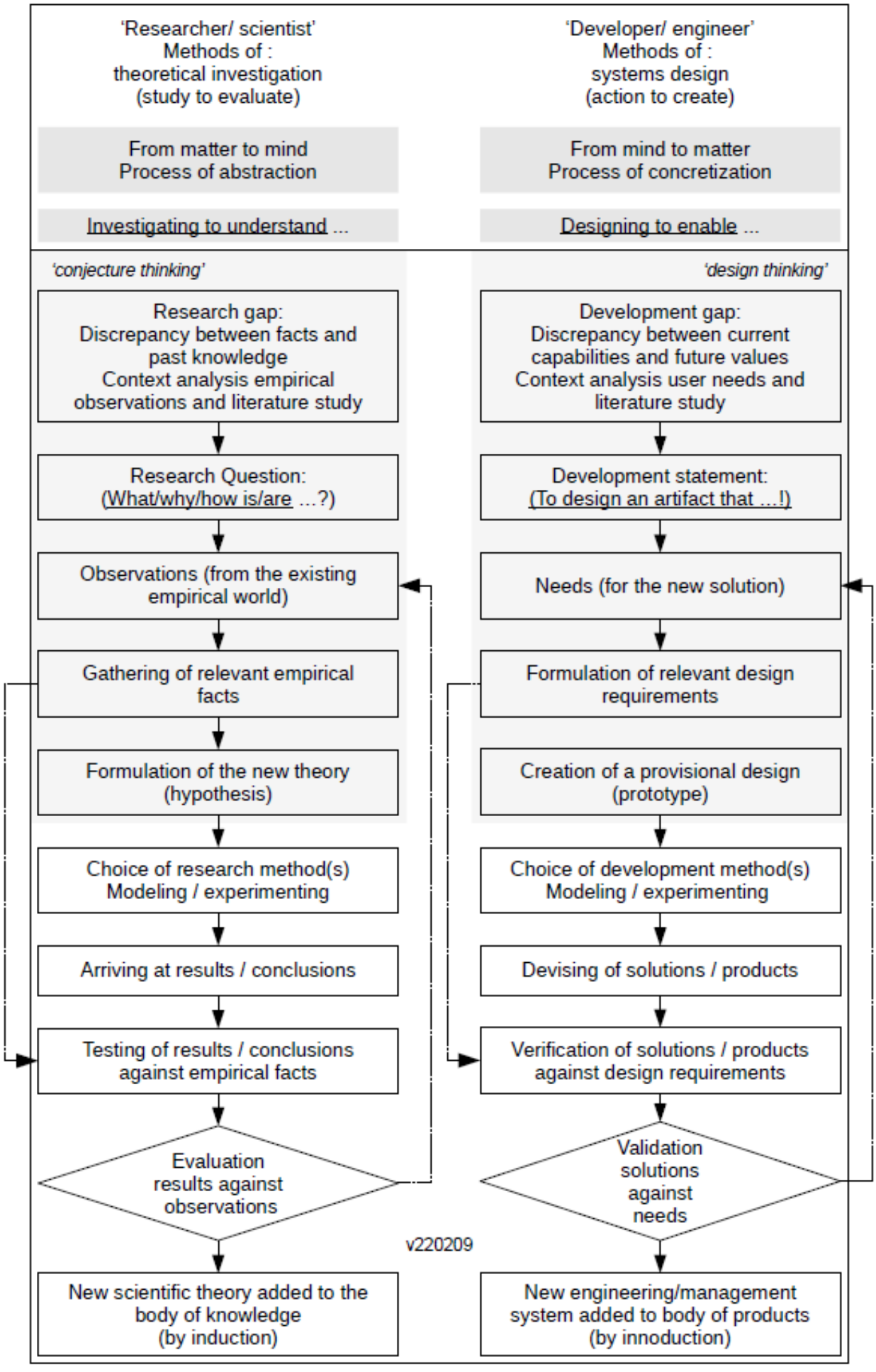
NOTE : the difference between the greenlight meeting and final presentation/defence is that only during the final presentation the student presents the answers to all questions.

NOTE: Your response is NOT a 'diary' type of report in which steps by step all details per project phase have been reported.

From greenlight to final presentation and graduation

After the green light is given, you can plan the **final presentation and your defence**. The **order and duration** of presentation and defence may differ and **must be settled at the greenlight meeting**, together with the graduation date and time.
Your thesis response should be distributed to the committee members one week before the graduation. It also needs to be uploaded on the TU Delft Repository in *Pure*. Instructions for uploading your thesis in *Pure*, using your NetID, are available at https://repository.tudelft.nl/content/education-upload-tips.

NOTE: an abstract of your work (1 A4 pdf) must be uploaded on Brightspace in the graduation archive.


'Researcher/ scientist'
Methods of :
theoretical investigation
(study to evaluate)
'Developer/ engineer'
Methods of :
systems design
(action to create)
From matter to mind
Process of abstraction
From mind to matter
Process of concretization
Investigating to understand ...
Designing to enable ...
'conjecture thinking'
'design thinking'
Research gap:
Discrepancy between facts and past knowledge
Context analysis empirical observations and literature study
Development gap:
Discrepancy between current capabilities and future values
Context analysis user needs and literature study
Research Question:
(What/why/how is/are ...?)
Development statement:
(To design an artifact that ...!)
Observations (from the existing empirical world)
Needs (for the new solution)
Gathering of relevant empirical facts
Formulation of relevant design requirements
Formulation of the new theory (hypothesis)
Creation of a provisional design (prototype)
Choice of research method(s)
Modeling / experimenting
Choice of development method(s)
Modeling / experimenting
Arriving at results / conclusions
Devising of solutions / products
Testing of results / conclusions against empirical facts
Verification of solutions / products against design requirements
Evaluation results against observations
Validation solutions against needs
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New scientific theory added to the body of knowledge
(by induction)
New engineering/management system added to body of products
(by innoduction)