

UNIVERSITEIT TWENTE.

**PROGRAMME-SPECIFIC PART OF THE
EDUCATION AND EXAMINATION
REGULATIONS FOR THE
BACHELOR'S DEGREE PROGRAMME IN
ELECTRICAL ENGINEERING**

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Chapter A General provisions

Article A1 Applicability

The following regulations form the programme-specific part of the university-wide Education and Examination Regulations as referred to in Article 7.13 of the Higher Education and Research Act (WHW), and apply to the Bachelor's degree programme in Electrical Engineering, from now on referred to as "the programme".

Article A2 Attainment targets of the programme

The general attainment targets for graduates of the Bachelor's degree programme in Electrical Engineering are listed below.

Knowledge:

- 1 Have knowledge and understanding in the field of Electrical Engineering, in particular analogue and digital electronics, Maxwell theory, classical mechanics, control engineering, communication science and analogue and digital signal processing.
- 2 Have knowledge and understanding of programming, digital logic and computer systems.
- 3 Have knowledge and understanding of calculus, linear algebra, differential and difference equations, linear systems, and probability.
- 4 For those who choose the module Device Physics: Have knowledge and understanding of the physics of basic quantum mechanics, electronic components, transducers and optical devices.
- 5 For those who choose the module Network Systems: Have knowledge and understanding of basic principles and key protocols in communication systems, networks, and networked applications.
- 6 Have knowledge on academic level of key theories, methods and practices in the fields mentioned above.
- 7 Can understand and reflect on theories, methods and practices in the field of electrical engineering.
- 8 Have knowledge of methods for planning and management of individual and team-based projects.

Skills:

- 9 Can use modern methods and tools in research and design to describe, analyse, model, implement, test and document systems in the domain of electrical engineering on a scientific basis.
- 10 Can assess theoretical and practical issues and substantiate and select appropriate solutions based on literature studies, models, analyses, simulations and / or test.

Competences:

- 11 Can work systematically and methodically.
- 12 Have ability to handle complex development-oriented and research-oriented situations in study or work contexts.
- 13 Have ability of carrying out studies and draw valid conclusions on a scientific basis.
- 14 Can independently function in a disciplinary as well as in an interdisciplinary collaboration with a professional attitude.
- 15 Is able to communicate academic problems and solutions to peers and non-specialists or partners and users.
- 16 Can translate academic knowledge and skills into practical problem solving.
- 17 Is able to study another academic field and is able to identify research and/or design in that field.
- 18 Can identify own learning needs and structure their own learning in different learning environments.
- 19 Have insight into another academic field and can use different approaches for research or design.

Article A3 Structure of the programme

All students must follow the programme full-time.

Article A4 Scope of the programme

The programme has a study load of 180 credits.

Article A5 Language of the programme

A 5.1

The Electrical Engineering programme will be taught in English.

A 5.2

1. The examinations of the programme will be held in English. Examinations may be held in a language other than English, with the permission of the Examination Board.
2. Having regard to the University's Code of Conduct for Working Languages, the provisions of Paragraphs 1 and 2 may be dispensed with, with the permission of the Examination Board.
3. Students do not need to know Dutch.

A 5.3

Students from abroad must be able to demonstrate that they have an adequate command of English, both oral and written.

- a. Students from countries that are signatories to the Treaty of Lisbon and who had English in their school-leaving examination meet this requirement.
- b. Students with a different previous education may be required to pass a recognized test in order to obtain admission to the programme – for example, by getting a total score of at least 6.0 in the IELTS test or at least 80 in the Internet-based TOEFL test. Students with a diploma from a country where English is the only official language of education are exempted from this language requirement.

Article A6 Laptop

Students should have a notebook (laptop) when they start their studies. The Notebook Service Centre (NSC) of the University of Twente will inform the future students about the minimum requirements for the laptop.

Article A7 Enrolment for exams and tests

Regulations for enrolment in exams and tests will be made public on the website "<http://www.utwente.nl/el/>".

Article A8 Registration of results

- The value 'VR' will be assigned to exemptions. In modules an exemption does not get a numerical value. In courses of the old curriculum an exemption counts as a 6.
- The highest grade always counts, also for the tests in the modules ("toetsen").

Article A9 Rules regarding BSA

- The programme makes use of the BSA (Binding Study Advise) module in OSIRIS
- The BSA is based on the results of modules. After the first module a positive, neutral or negative interim advice will be given.
- The official advice is the interim and final advice.
- The official advice is provided by the programme director.
- The BSA is sent by e-mail and is signed digitally.

Chapter B Various types of assessment and the degree programme

Article B1 The content of the programme

1. The first year consists of the following units of study, with the indicated study load in credits:
 - a. IEEE (Introduction to Electrical and Electronic Engineering) 15 credits
 - b. Electric Circuits 15 credits
 - c. Electronics 15 credits
 - d. Fields and Waves 15 credits

2. The second year consist of the following units of study, with the indicated study load in credits:
 - a. The compulsory modules:

Computer Systems	15 credits
Systems and Control	15 credits
Signal Processing and Communications	15 credits
 - b. The elective modules (one of them to be chosen):

Device Physics	15 credits
Network Systems	15 credits

3. The third year consist of the following units of study, with the indicated study load in credits:
 - a. Two elective modules of 15 credits each 30 credits
 - b. The bachelor thesis project 30 credits

Article B2 Special features of the modules

1. Projects form an integral part of all modules.
2. Lab work form an integral part of all modules.
3. Projects and lab work are carried out individually and by groups of students according to the regulations of the individual modules.

Article B3 The procedure for examinations

1. Modules will be assessed by means of intermediate tests ("toetsen"), which may be oral or written.
2. A single grade will be given for each module. The grade shall be based on the results of tests, papers and lab work. An assessment of all parts of the module by the team of teachers at the end of the module leads to the final grade. One person of the Examination Board will attend this assessment meeting.
3. Within modules students get opportunities for repeating the intermediate tests.
4. The Examiner may deviate from the provisions of Paragraphs 1 to 3 in individual cases in agreement with the examination board.
5. In the case of a minor, the Education and Examination Regulations of the department teaching that minor shall apply.
6. The assessment of lab work and projects being part of the modules, referred to in Article B2, may require a logbook to be kept during the lab work and/or a written and/or an oral report on the lab work and project. Lab work and a project are assessed on the basis of the performance shown during the exercise, and on the basis of the logbook, the report and/or the presentation on the exercise if they are demanded.

7. A report must be written and a presentation must be given on the activities involved in the bachelor thesis project. The Examiners for these units of study may also require interim presentations to be given.

Article B4 Prior knowledge requirements

1. Students are entitled to start with the two elective modules in the third year only if they have completed six modules. Elective modules may have extra prior knowledge requirements, which can be found in the Osiris description of these modules.
2. Students are entitled to start with the bachelor thesis project only after successfully completing all modules of the first and second year.

Article B5 The Minor

1. A student who is enrolled for the Bachelor's degree programme in Electrical Engineering and who meets the admission requirements referred to in Article B6 Paragraph 1, may take any minor offered by the University, with the exception of those minors listed in the 'Minor admission review', for which the Examination Board has stated that these may not be chosen by the student. The Examination Board shall update the 'Minor admission overview' annually.
2. In addition to the provisions of Paragraph 1, a student may, with the permission of the Examination Board, put together a minor by combining his own selection of the units of study offered by any university. The Examination Board shall draw up guidelines for the approval of such requests.

Article B6 The bachelor thesis project

1. When the prior knowledge requirements referred to in Article B4 Paragraph 2 are met, the student may select a chair at any university as the site where he will carry out the bachelor thesis project.. If the assignment is performed outside the department of Electrical Engineering of the University of Twente, the permission of the Programme Director is required. In any case one of the chairs of the department of Electrical Engineering at the University of Twente is responsible for the assignment.
2. The chair shall appoint a supervisory committee consisting of at least two persons. At least one of members of the supervisory committee shall be a tenured member of the academic staff of the department of Electrical Engineering at the University of Twente. The supervisory committee shall appoint an executive supervisor from amongst its members.
3. The supervisory committee shall include at least one examiner.
- 4a. The bachelor thesis project has a study load of 30 credits. Students and supervisors should reach agreement on the dates on which the assignment is to begin and to end, taking into account possible other obligations of the student.
- 4b. The student's performance shall be assessed on the closing date, irrespective of the stage his work has reached.
- 4c. If the grade for the assignment is below a pass grade, the chair may give the student the opportunity to continue working on the assignment so as to meet the requirements for a pass grade. The extra time allowed shall however be limited to a study load equivalent to 6 credits. The grade for the assignment may not exceed a 6 in this case.
- 4d. The Programme director (OLD) decides about additional time in cases that a delay is not caused by the student.
- 4e. If the student's performance is still unsatisfactory after extra time has been allowed, he will have to do a new assignment with another theme and a different supervisory committee or under the authority of a chair.

Article B7 Extra Curricular Activities

For those students who are looking for more than the usual academic challenges, extracurricular activities are organised:

- The Honours programme is designed for talented, interested and highly motivated students. The student is offered a 30 EC programme. The programme starts in the first year.
- The Excellence stream is a mathematics programme with a high level of abstraction. It is intended to deepen the mathematical knowledge.

Chapter C Master's programmes following Bachelors in Electrical Engineering

Article C1 Master's programmes following Bachelors in Electrical Engineering

Students with a Bachelor's degree in Electrical Engineering from the University of Twente are entitled to take the following Master's degree programmes:

- The Master's degree programmes in Electrical Engineering at the University of Twente, Delft University of Technology and Eindhoven University of Technology
- The Master's degree programme in Systems & Control offered jointly by the University of Twente, Delft University of Technology and Eindhoven University of Technology.
- The Master's degree programme in Embedded Systems offered jointly by the University of Twente, Delft University of Technology and Eindhoven University of Technology.
- The Master's degree programme in Nanotechnology at the University of Twente

Chapter D Free-choice Bachelor's degree programme

Article D1 Relevant concepts

1. The free-choice Bachelor's degree programme is a programme as referred to in Article 7.3c of the Higher Education and Research Act (WHW). A student can put such a programme together by selecting from the units of study offered by an institution. Since a diploma is also awarded for successful completion of a free-choice programme, the programme requires permission from the most relevant Examination Board.
2. When giving such permission, the Examination Board shall determine which degree programme the free-choice programme compiled by the students in question shall be deemed to belong to.

Article D2 Permission of the Examination Board

The Examination Board shall draw up guidelines for granting the permission referred to in Article D1, with the provision that the free-choice degree programme must be coherent, must have a level comparable with that of the Bachelor's programme referred to in Chapter B, and must meet the requirements stated in Article D3.

Article D3 Examinations and structure of the free-choice Bachelor's degree programme

1. The free-choice Bachelor's degree programme has a final assessment for the Bachelor's degree.
2. The free-choice Bachelor's degree programme must be followed full-time, and has a study load of 180 credits.

Article D4 The composition of the free-choice Bachelor's degree programme

The free-choice Bachelor's degree programme shall contain at least one component that is comparable with the bachelor thesis project referred to in Article B6. This component shall have a study load of 30 credits.

Article D5 Validity of arrangements

1. The regulations concerning the periods during which examinations can be taken and the frequency of the examinations, the prior knowledge requirements for the various units of study, the way in which examinations are held and the form in which the examination results are announced shall be the Education and Examination Regulations applying to the degree programme to which the unit of study in question normally belongs.
2. If the regulations conflict or lead to insuperable problems for students, the Electrical Engineering Examination Board may permit departures from the regulations.
3. Units of study that have to be successfully completed in accordance with the provisions of Paragraph 1 before a student can proceed to units of study that form part of the free-choice degree programme need not necessarily belong to the free-choice degree programme themselves.
4. In exceptional circumstances, the examiner for a unit of study that must be successfully completed before another unit of study is started may decide that this condition may be waived.

Article D6 Sequence of the various parts of the free-choice Bachelor's degree programme

1. A student who has submitted a request for approval of a free-choice Bachelor's degree programme he has put together, shall include the sequence in which the various parts of the programme shall be taken.
2. The Examination Board charged with giving the approval may decide that certain parts of the programme shall be taken in another sequence than that specified by the applicant.
3.
 - a. In particular, the Examination Board charged with giving the approval may decide that certain named parts of the programme may not be taken until other named parts of the programme have been successfully completed.
 - b. The assignment referred to in Article D4, may not be started until at least 120 EC have been successfully completed.
 - c. The chair under whose authority the unit of study referred to in Article D4 is performed may determine, in addition to the provisions of a. and b. above, that if the content of the assignment demands this, at most two named units of study with a study load of at most 15 credits shall be successfully completed before the assignment may be started.

Chapter E Study Plan

1. The Study Advisor is responsible for overseeing the drawing up of the study plan. The Study Advisor shall send students a digital study plan form, at a time that allows them at least 10 working days to fill it. The completed form must be submitted by students no later than the last working day before the examination period of the second or the fourth quarter.
2. All first-year students are asked to amend the study plan before the start of each successive quarter of the first year. If students can demonstrate that they are making the expected progress in their studies, this requirement is a request rather than an obligation.
3. First-year students are asked to amend the study plan each quarter to take into account changes in the curriculum recorded in the supplement to the programme-specific appendix relating to Article 2.
4. The study plan is a standard item of discussion for first-year students in the talks they have with the Study Advisor. If the Study Advisor considers this to be necessary, he will send students a written comment on their study plan in the form of an e-mail message. In the case of second and third-year students, the Study Advisor shall determine when, and to which students, he sends a comment on the study plan. If a student asks the Study Advisor for advice on his completed study plan, he will always receive a comment from the Study Advisor.
5. Most of the comments made by the Study Advisor on a student's study plan will be made orally, during the regular supervisory meetings with the student. In addition, written comments may be made on completed study plans. If a student asks for advice, a comment is always sent.
6. *Binding recommendation on continuation of studies*: advice about the study plans submitted may not be used as evidence in procedures relating to binding recommendation on continuation of studies.

Chapter F Final and introductory provisions

Article F1 Hardship clause

If these Regulations give rise to evidently unfair or otherwise unintended consequences, the Programme Director or the Examination Board (depending on which is competent to deal with the issue in question) may authorize a departure from these Regulations.

Article F2 Introduction and amendment of these Regulations

1. Amendments to these Regulations are approved by the Dean in a separate decree, and recorded in Article F3 Paragraph 2.
2. Amendments to arrangements and guidelines relating to these Regulations but formulated elsewhere are approved by the Dean in a separate decree, and recorded in Article F3 Paragraph 2.
3. No amendment to these Regulations shall come into force during the current academic year, unless they can be reasonably assumed not to have any adverse effect on the interests of students (including external students). Amendments shall if possible be announced six months before they come into force.
4. The replacement of the old Regulations and the amendments introduced in these new Regulations shall further not adversely influence the interests of students (including external students) as regards:
 - the period of validity of the Regulations as determined by the Examination Board,
 - the approval by the Examination Board of a free-choice degree programme or a free-choice minor put together by students (including external students),
 - any other decision concerning students (including external students) taken by the Examination Board pursuant to these Regulations or the preceding Regulations.
5. When these Regulations or arrangements and guidelines relating to these Regulations but formulated elsewhere are amended, transitional arrangements shall be approved to determine in any case under what circumstances and/or during which period use can still be made of the original Regulations.

Article F3 Date of commencement

These Regulations come into force on 1 September 2014.

Appendix Transitional arrangement for new Education and Examination Regulations for 2014/15

Article 1 deals with students starting their second year of study in year 2013/14 or earlier, regarding the second and third year of the curriculum of Electrical Engineering

Article 1.1 Program cohort 2012/2013

The second and third years of the degree programme, as referred to in Article 7.30 of the Higher Education and Research Act (WHW), consist of the following units of study:

a. The subjects:

Linear Difference and Differential Equations	5 credits
Probability Theory	3 credits
Mechanics and Transducers Science	3 credits
Telematics Systems and Applications	4 credits
Measurement Science	4 credits
Linear Systems	6 credits
Computer Organization	3 credits
Computer Systems	5 credits
Dynamical Systems	3 credits
Control Engineering	4 credits
Semiconductor Devices	4 credits
Communication Practice	1.5 credit
Introduction to Chairs	1 credit
Electrodynamics	4 credits
Random Signals and Noise	5 credits
Embedded Signal Processing	7 credits
Optical Basic Functions and Microsystems	3 credits
Introduction to Communication Systems	3 credits
Minor	20 credits

b. Practical training:

Mechatronics Project	4 credits
B2 Project	11 credits
Realization in Materials	1.5 credits
Final Bachelor's Assignment	15 credits

Article 1.2 Special features of the various units of study

1. Lab work forms an integral part of the unit of study Computer Organization.
2. Lab work forms an integral part of the unit of study Fundamentals of Digital Technology.
3. Lab work forms an integral part of the unit of study Measuring Technology.
4. An elective lab work may be taken in the unit of study Computer Systems.
5. Lab work and a project form an integral part of the unit of study Embedded Signal Processing.
6. The examination for the Minor may be divided into parts.

Article 1.3 The procedure for examinations

1. Modules will be assessed by means of interim examinations, which may be oral or written.
2. A single grade will be given for each module.
3. No examination is held for the unit of study "Introduction to Chairs".
4. The unit of study Electromagnetic Field Theory shall be assessed by an oral examination.
5. The unit Control Engineering referred to in Article 1.1 will be assessed by an oral exam.

6. The units of study listed in Article 1.1 under the heading "The subjects" shall be assessed by a written examination, with the exception of the units of study mentioned in Paragraphs 4 and 5 of the present article.
7. If lab work or a project forms an integral part of a unit of study as laid down in Article 1, no examination can be held for that unit of study until the lab work or project has been successfully completed. However, the Examiner for the unit of study in question may allow the examination to be held before the lab work or project has been completed, or before it has been successfully completed; however in that case the examination will not be marked until the lab work or project has been successfully completed.
8. The Examiner may deviate from the provisions of Paragraphs 1-6 in individual cases.
9. In the case of a Minor, the Education and Examination Regulations of the department teaching that Minor shall apply.

Article 1.4 The procedure for the assessment of Lab work

1. Without prejudice to the provisions of paragraph 2, the Examiners of the lab work referred to in Articles 1.1 and 1.2 may require a logbook to be kept during the lab work and/or a report on part on the whole of the lab work to be submitted.
2. A report must be written and a presentation must be given on the activities involved in each of the units of study designated as the B2 Project and the final Bachelor's assignment. The Examiners for these units of study may also require interim presentations to be given.
3. A student can only receive grades for lab work if he has participated in that exercise.
4. Lab work is assessed on the basis of the performance shown during the exercise, and on the basis of the logbook, the report and/or the presentation on the exercise if these are demanded.

Article 1.5 Prior knowledge requirements

1. Students may only take the unit of study Mechatronics Project after they have taken the units of study Mechanics and Transducers Science, Measurement Science, Dynamical Systems and Control Engineering and if they have demonstrated to the satisfaction of the Examiner for the project that they possess enough knowledge to be able to participate in the project with good results.
2. Students may only take the unit of study designated as the B2 Project after they have completed units of study from the Bachelor's degree programme with a combined study load of 77 or more credits, and if they have passed the final assessment for the foundation year.
3. Students may only take the Minor after they have successfully completed units of study from the Bachelor's degree programme with a combined study load of 80 or more credits.
4. Students may only take the unit of study designated as the final Bachelor's assignment after they have successfully completed units of study from the Bachelor's degree programme with a combined study load of 88 or more credits, including the B2 Project. The chair under whose authority the final Bachelor's assignment is performed may stipulate that certain units of study other than the B2 Project should belong to the completed package of 88 credits.
5. The examiner for a unit of study for which prior knowledge is required shall check, before a student takes the examination for that unit of study or before he participates in that unit of study, that the prior knowledge requirement is satisfied. If this requirement is not satisfied, the Examiner may nevertheless permit the student to take the examination for that unit of study or to participate in that unit of study if the Examiner is convinced that the student does possess sufficient prior knowledge to sit the examination or to participate in the unit of study with good results.

Article 1.6 Sequence of units of study and examinations

1. The order in which units of study can be followed and examinations can be taken, together with the periods during which the examinations can be taken, are given in the timetables.
2.
 - a. Examiners may decide, at a student's request or for some other reason, that the examination for a certain unit of study can be held outside the periods referred to in Paragraph 1 of this article.
 - b. If the examiner for a unit of study decides that due to exceptional circumstances it is reasonable to offer an extra examination opportunity open to all students following that unit of study, he shall submit a request to this effect to the Examination Board; the Examination Board must consult the Programme Director before reaching a decision on this request.

Article 1.7 The Minor

1. A student who is enrolled in the Bachelor's degree programme in Electrical Engineering and who meets the admission requirements referred to in Article 1.5 Paragraph 3 may take any minor offered by the University, with the exception of those minors listed in the 'Minor admission review' for which the Examination Board has stated may not be chosen by the student. The Examination Board shall update the 'Minor admission overview' annually.
2. In addition to the provisions of Paragraph 1, a student may, with the permission of the Examination Board, put together a minor by combining his own selection of the units of study offered by any university. The Examination Board shall draw up guidelines for the approval of such requests.

Article 1.8 The final assignment

The rules stated in B6 apply except for the provision made in Article 1.5 Paragraph 4

Article 2 deals with students starting their second year of study in year 2011/12 or earlier, regarding the first year of the curriculum of Electrical Engineering

Article 2.1 Cohort 2011/2012 or earlier

Examination opportunities for most units of study from the curriculum of 2011-12 will be offered in the academic year 2014/15.

Article 2.2 Programme cohort 2011/2012 or earlier

Students who started in the year 2011/12 or earlier who want to follow the old curriculum will be offered the following facilities:

- a) Introduction to Electrical and Electronic Engineering - IEEE (191211580): the timetable of the IEEE module will indicate which units of study are equivalent to the old subject and should be followed.
- b) Introduction to Object-Oriented Programming (192110174): the timetable of the IEEE module will indicate which units of study are equivalent to the old subject and should be followed. What will be offered on programming in the module and the exam is equivalent to 192110174.
- c) Calculus 1 (201000177), Calculus 2 (191511040) and Linear structures (191510103): students can join the math parts in Modules 1.1 – 1.4 and make the tests in the modules.
- d) Network Analysis (191210050): the timetable of the Electric Circuits module will indicate which units of study are equivalent to the old subject and should be followed
- e) Measuring Instruments and Network Analysis Lab (192130014): the timetable of the Electric Circuits module will indicate which units of study are equivalent to the old subject and should be followed
- f) IEEE Lab Work (191211600): the timetable of the IEEE module will indicate which units of study are equivalent to the old subject and should be followed
- g) Basic Electronic Circuits (191211750): the timetable of the Electronics module will indicate which units of study are equivalent to the old subject and should be followed
- h) Basic Electronic Circuits Lab Work (191211760): the timetable of the Electronics module will indicate which units of study are equivalent to the old subject and should be followed
- i) Mid-Foundation-Year Project: students should contact the coordinator of the module 1.3 electronics for an assignment. This possibility is offered in this year for the last time.
- j) Electronic Functions (191211770/191211780): the timetable of the Electronics module will indicate which units of study are equivalent to the old subject and should be followed
- k) End-of-Foundation-Year Project will not be offered anymore. Students should contact the Bachelor Coordinator for an alternative.
- l) Students who have completed their final Bachelor's assignment but still have to do the unit of study Information Storage can do this in the form of an assignment with the consent of the relevant member of teaching staff. All other students no longer have to do this unit of study, and their final Bachelor's assignment will have a study load of 14.5 credits. Students who have already done the unit of study Information Storage will only have to do a final Bachelor's assignment worth 11.5 credits.
- m) Students who started their study before September 2012 and did not complete the course 'Informatieopslag' will receive the 3EC for a longer bachelor assignment.

Article 2.3 Programme cohort 2012/2013 or earlier

Students who started in the year 2012/13 or earlier will be offered the following facilities:

- n) Fundamentals of Digital Logic (192130014): The practical work will be offered in this year. They have to contact the teaching staff of Module 2.1 Computer Systems (Molenkamp)
- o) Theory of Electromagnetic fields (191211290): Students are strongly advised to follow the complete module Fields and waves. Else students can contact the module coordinator to work on the problems equivalent to Theory of Electromagnetic fields.

- p) Lab Course Electromagnetic Field Theory (191210080): Contact the Coordinator of Module 1.4 for an assignment.

Article 3 Regulation of the exams for students who started in 2013 or earlier

Students who started their study before September 2013 and finalize their last course of the foundation course (propedeuse) during the academic year 2013-2014 will receive a foundation course certificate.

Article 4 Regulation related to abolishment of the course Energy technology

Students who started their study before September 2011 and who did not finalize the course Energy Technology but passed the courses Random Signals and Noise and/or Embedded Signal Processing receive 17 EC or 16 EC (depending whether or not the course "Informatieopslag" is finished) for the bachelor assignment. They are exempted from Energy Technology.