

UNIVERSITEIT TWENTE.

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

**May 19, 2018**

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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, 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.
- 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.
- 20 Takes account of the temporal and social context of science and technology and is able to integrate this into his or her scientific work.

### **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 are required to pass a recognized test in order to obtain admission to the programme –at least 6.5 in the IELTS test for both the active level of English (writing, speaking) as well as the passive level (reading, listening) or at least 84 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**

1. Every student must sign up in the student information system for participation in a module. It is also mandatory to register beforehand for every intermediate test.
2. By way of exception to the provisions of paragraph 1, any student who has correctly signed up for participation in the instruction/classes for a particular course and has been admitted will also be signed up for the subsequent interim examination, unless the degree programme stipulates a different approach.

### **Article A8 Registration of results**

1. 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.
2. The highest grade always counts, also for the intermediate tests in the modules.

### **Article A9 Rules regarding BSA**

1. The programme makes use of the BSA (Binding Study Advise) module in OSIRIS
2. The BSA is based on the obtained results in the first four modules. In article B.5 an overview is given of the parts of each module of which the results will be kept, even if the module is not completed.
3. A positive BSA is given only if the student has successfully completed at least 45 EC in the first year.

4. An additional condition for a positive BSA is that two of the four mathematics grades should be at least 5.5.
5. After the first module a positive, neutral or negative interim advice will be given.
6. The official advices are the interim and final advices.
7. The official advice is provided by the programme director.
8. The BSA is sent by e-mail and is signed digitally.

#### **Article A10 Evaluation and safeguarding of education**

1. Within 2 weeks after the closure of a module, each student participating in a module will receive an invitation to participate in the UT – Student Experience Questionnaire (UT-SEQ). The UT-SEQ is a centrally organised online evaluation addressing various aspects of the respective module.
2. The programme has installed an independent evaluation committee. On request of the programme committee, the programme director, or via the student organization Scintilla, this evaluation committee will organize an evaluation, consisting of at least two panel discussions. A panel discussion consists of five to ten students participating in the module that is being evaluated, the module coordinator and / or lecturers involved in the module that is being evaluated and a chair from the evaluation committee.

## 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 minor modules of 15 credits each 30 credits
  - b. Electronic Systems Design 15 credits
  - c. The Bachelor thesis project 15 credits

A more detailed description of each module is given in Appendix B.

### **Article B2 Special features of the modules**

1. Projects form an integral part of all modules.
2. Lab work forms an integral part of all modules.
3. Projects and lab work are carried out individually or 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, which may be oral or written.
2. For an oral test, there must be proof that the student was treated properly and that the assessment is reliable. This can be shown by, e.g., the presence of a



second expert or a video recording of the sitting of the oral test. The assessment is documented through a form that shows that the intended learning outcomes are met.

3. A single grade will be given for each module. The grade shall be based on the results of tests, papers and lab work. Compensation of insufficient grades of intermediate tests is arranged within the module (if applicable). The rules will be made clear to all students before the start of the module. 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 be involved and monitor this assessment.
4. Within modules students get opportunities for repeating the intermediate tests.
5. The Examiner may deviate from the provisions of Paragraphs 1 to 4 in individual cases in agreement with the Examination Board.
6. In the case of a minor, the Education and Examination Regulations of the department teaching that minor shall apply.
7. 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.
8. A report or paper 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 without limitation on the number of completed modules. Elective modules may have prior knowledge requirements, which can be found in the Osiris description of these modules.
2. Students are entitled to start with the Electronic Systems Design module (module 11) only after having successfully completed 8 out of the 10 previous modules in the Electrical Engineering curriculum, as well as having successfully completed module 3.
3. Students are entitled to start with the Bachelor thesis project (module 12) only after successfully completing all modules of the first and second year.

#### **Article B5 Period of validity for intermediate tests**

1. In the EE curriculum the validity of intermediate tests of failed modules is valid until the start of the given module the next academic year.
2. The period of validity for a sufficient module grade is infinite
3. Each module consists of a core activity (or a couple of related core activities). In some modules, some satellite activities are identified as well. If the core

activity or the satellite activity is finished with a positive result (higher or equal 5.5), this result can be reused. The validity of the core or satellite results is the same as the validity of module grades.

4. For each of the 10 modules in the curriculum the core activities and satellite activities are defined as:
  - a. Module 1 : Satellite = mathematics line (4EC); Core = the rest of the module (11EC)
  - b. Module 2 : Satellite = mathematics line (3EC); Core = the rest of the module (12EC)
  - c. Module 3 : Satellite = mathematics line (3EC); Core = the rest of the module (12EC)
  - d. Module 4 : Satellite = mathematics line (3EC); Core = the rest of the module (12EC)
  - e. Module 5 : Satellite = mathematics part (5EC); Core = the rest of the module (10EC)
  - f. Module 6 : Satellite = linear systems (3EC); Core = the rest of the module (12EC)
  - g. Module 7A : Complete module is core activity (15EC)
  - h. Module 7B : Complete module is core activity (15EC)
  - i. Module 8 : Complete module is core activity (15EC)
  - j. Module 11 : Complete module is core activity (15EC)
  - k. Module 12 : Complete module is core activity (15EC)
5. Individual requests other than mentioned in this article can be sent to the Examination Board if well motivated with a study planning and after advice of the study advisor.

### **Article B6 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 B4 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 can make a proposal for a minor by combining his own selection of the units of study offered by any university ("free minor"). Guidelines for the proposal of a free minor are available from the Examination Board. To be accepted as a free minor, approval of the free minor proposal by Examination Board is required.

### **Article B7 The Bachelor thesis project**

1. When the prior knowledge requirements referred to in Article B4 Paragraph 3 are met, the student may select a chair at any university as the site where the student 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 prior to starting the thesis project. In any case one of the chairs of the department of Electrical Engineering at the University of Twente is responsible for the assignment. The following research groups (chairs) take part in the Electrical Engineering programme:

<b>Name of the chair</b>	<b>Abbreviation</b>	<b>Specialisation</b>
Biomedical and Environmental Sensorsystems	BIOS	lab-on-a-chip systems for biomedical and environmental applications
Biomedical Signals and Systems	BSS	neurotechnology and bio-mechatronics
Computer Architecture for Embedded Systems	CAES	dependable integrated systems
Robotics & Mechatronics	RAM	robotics and mechatronics
Design and Analysis of Communication Systems	DACS	communication networks
Integrated Circuit Design	ICD	integrated circuit design
Optical Science	OS	integrated optical microsystems
Nano Electronics	NE	nanoelectronics
Data Management and Biometrics	DMB	Machine learning, computer vision and biometrics
Integrated Devices and Systems	IDS	Devices for integrated circuits, micro sensors and systems
Telecommunication Engineering	TE	telecommunication engineering

2. The chair, not the student, shall appoint a supervisory committee consisting of at least three persons. The committee consists of the daily supervisor, an assistant professor or associate professor or full professor of the chosen research chair and a member not being a member of the research chair involved (sometimes called an external member).
3. The supervisory committee shall include at least two examiners. The third member must be an expert in the field, PhD candidate, postdoc, assistant professor, associate professor or full professor.
4. The Bachelor thesis project has a study load of 15 credits. The project should be finished within the module.
5. The student's performance shall be assessed on the closing date, irrespective of the stage his work has reached.
6. 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 3 credits. The grade for the assignment may not exceed a 6 in this case.

7. The Programme director (OLD) decides about additional time in cases that a delay is not caused by the student.
8. If the student's performance is still unsatisfactory after extra time has been allowed, the student will have to do a new assignment with another theme and a different supervisory committee or under the authority of a different chair.

### **Article B8 Extracurricular Activities**

For those students who are looking for more than the usual academic challenges, extracurricular activities are organised in the Honours programme. The Honours programme is designed for talented, interested and highly motivated students. The student is offered a 30 EC programme. The programme typically starts in the first year.

If the honours programme is completed successfully, this will be stated on the degree supplement as an extracurricular programme.

### **Article B9 Cum Laude**

The Bachelor Electrical Engineering examination can be taken with the designation 'cum laude'. This will be mentioned on the diploma. The guidelines for awarding this designation are that each of the following conditions must be fulfilled:

- a. The 180 EC of the bachelor programme is finished within 3.5 years (time limits requirement);
- b. The average module grade is 8.0 or higher;
- c. No exemptions were granted.
- d. The assessment of the final project (Module 12 for the TOM curriculum) is 9 or higher.

In exceptional cases, in response to a student's request, the Examination Board can award the designation "cum laude" if the student had pardonable grounds for non-compliance with the time limits requirement. This could be the case, for instance, when delay has been acknowledged in accordance with the provisions stipulated by the institution.

## 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 B7. This component shall have a study load of 15 credits.

### **Article D5 Validity of arrangements**

1. The Education and Examination Regulations applying to the degree programme to which the unit of study in question normally belongs is leading. This concerns the periods during which examinations can be taken, 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.

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, shall include the sequence in which the various parts of the programme shall be taken.
2. The Examination Board 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 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 Final and introductory provisions

### **Article E1 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 E2 Introduction and amendment of these regulations**

1. Amendments to these regulations are approved by the Dean in a separate decree and recorded in Article E3 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 E3 Paragraph 2.
3. No amendment to these regulations will become active 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 take effect.
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 E3 Date of commencement**

These regulations will be active on 1 September 2018



## Appendix A. Transitional arrangement for new Education and Examination Regulations for 2018/19

**Article 1 deals with the general concepts of the transitional arrangements.**

### **Article 1.1            General concepts**

1. After a course is terminated in the old curriculum, there will be test-opportunities for two additional years.
2. The test opportunities can be written exams in the same quartile as in the old curriculum, but also oral exams might be scheduled if only a few students need to take the resit.
3. Two years after termination of the course, no extra tests will be offered. Students who did not complete all the courses in the old curriculum will be transferred to the TOM-module curriculum (which can result in re-doing parts which were finished before).

### **Article 1.2. Special arrangements**

1. In case the courses “Theory of Electromagnetic fields + practical work” and “Electrodynamics” should be done, students can do the module “Fields and Waves” (without the math part). The grade for the module will be taken as grade for both the “Theory of Electromagnetic fields + practical work” and “Electrodynamics” courses.
2. For the courses “Control Engineering”, “Dynamical Systems”, “Linear Systems” and the “Mechatronics project” the module “Systems and Control” can be done. The grade for the subtests in the module will count as grade for the individual courses. The complete module must be done.
3. For the courses ‘Probability theory’, ‘Introduction to communication systems’ and ‘Random signals and noise’ module 2.4, ‘Signal processing and communications’ can be taken as alternative. This module integrates the three courses. Grade of the module will count as grade for the three courses.
4. The course ‘Dynamical Systems’ is identical to the MSc-course ‘Engineering Systems Dynamics’ (191210431). This MSc-course is a bridging course for non-EE students. Students who need to do the ‘Dynamical Systems’ course can follow the MSc-course (in the first quartile). Several written tests will be offered during the academic year

**Article 2 deals with arrangements for courses from the old Electrical Engineering curriculum.**

**Article 2.1 Arrangements for first year courses:**

No possibilities for old first year courses are given anymore. Students who did not complete the first year courses in the old curriculum will be transferred to the TOM-module curriculum (which can result in re-doing parts which were finished before).

**Article 2.2 Arrangements for second year courses:**

No possibilities for old second year courses are given anymore. Students who did not complete the second year courses in the old curriculum will be transferred to the TOM-module curriculum (which can result in re-doing parts which were finished before).

**Article 2.3 Arrangements for third year courses:**

No possibilities for old third year courses are given anymore. Students who did not complete the third year courses in the old curriculum will be transferred to the TOM-module curriculum (which can result in re-doing parts which were finished before).

Two exceptions are in place:

- For the minor, students can choose existing minor modules.
- For the Bachelor thesis project arrangements see Article B7.

## Appendix B. Detailed description of the EE modules

In this appendix, an overview of the 11 Electrical Engineering modules is given. Detailed description of the modules, including learning aims and workload breakdown is given on their respective Osiris pages. For all modules the language of instruction and testing is in English. As presented in Article B5 of this document, the mathematics parts of modules 1-5 is allowed for separated assessment. All other parts, as well as the remaining six modules are considered as core activity.

In summary:

Module	Name:	Parts	ECs
1	IEEE	IEEE	11
		Mathematics-line	4
2	Electric Circuits	Electric Circuits	12
		Mathematics-line	3
3	Electronics	Electronics	12
		Mathematics-line	3
4	Fields & Waves	Fields & Waves	12
		Mathematics-line	3
5	Computer Systems	Computer Systems	10
		Linear Difference and differential equations	5
6	Systems & Control	Systems & Control	12
		Linear Systems	3
7A	Device Physics		15
7B	Network Systems		15
8	Signal Processing & Communications		15
11	Electronic System Design		15
12	Bachelor thesis project		15