TEACHING AND EXAMINATION REGULATIONS (TER)
(see Article 7.13, WHW)

2019 – 2020

MASTER'S DEGREE PROGRAMMES

Applied Mathematics
Computer Engineering
Computer Science
Electrical Engineering
Embedded Systems
Sustainable Energy Technology

DELFT UNIVERSITY OF TECHNOLOGY

Faculty of Electrical Engineering, Mathematics and Computer Science

Most important changes TER MSc 2019-2020

Overview most important changes TER opposite to 2018-2019 version:

New

Article 10D (master/TER):	**new** is the annotation for Quantum Technology, which is open to EE, CE, ES and CS students.

Miscellaneous

article 3:	Stricter entrance requirements have been formulated for all EEMCS MSc programmes regarding students with BSc diploma's obtained in India. These will apply for academic year 2020-2021, but need to be mentioned in this TER.
article 7a section 3 (master/TER):	The formulation regarding the Double Degree is improved.

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Part 1 General

Article 1 – Areas to which the regulations apply

1. These regulations apply to teaching and examinations of the Master's degree programmes in Applied Mathematics, Computer Engineering, Computer Science, Electrical Engineering, Embedded Systems and Sustainable Energy Technology hereafter referred to as the programmes.
2. These programmes are conducted under the responsibility of the Faculty of Electrical Engineering, Mathematics and Computer Science at Delft University of Technology (EEMCS), hereafter referred to as the faculty.
3. The programme is governed by Implementation Regulations (appendix) which constitute part of these Teaching and Examination Regulations.
4. The Teaching and Examination Regulations and the Implementation Regulations are laid down by the Dean.

Article 2 – Definitions of terms used

The terms used in these regulations should be interpreted as meaning the same as in the Higher Education and Scientific Research Act, insofar as they are defined in that Act.

The following terms are to be defined as follows:

a. Act: the Higher Education and Scientific Research Act (in Dutch, the WHW), in the Dutch Bulletin of Acts, Orders and Decrees, number 593 and as amended since;

b. programme: the Master's degree programme as denoted in Article 7.3a section 1, of the Act;

c. student: anyone enrolled at Delft University of Technology as a student or extraneous student for the purpose of benefiting from education and/or for the purpose of sitting the examinations and undergoing the final examination which form part of the programme;

d. cohort: the group of students who have registered for a degree programme for the first time in a given academic year;

e quarter: period of 10 (or 11, in the fourth quarter) weeks as stipulated in the academic calendar;

f. course: a teaching unit within the programme as intended in Article 7.3, section 2 and 3 of the Act, with which an examination is associated.

g. practical exercise: course or component of a course aimed at the acquisition of particular skills. An assessment can be associated with a practical exercise. The following can be understood as practical exercises:
- writing a thesis or paper;
- conducting a project or experimental design;
- completing a design or research assignment;
- completing a project;
- conducting a literature review;
- completing an internship;
- participating in fieldwork or an excursion;
- conducting tests and experiments;
- participating in other educational activities aimed at enabling participants to attain certain skills;

h. examination: investigation of the student's knowledge, insight and skills with regard to a subject, along with the assessment of that investigation by at least one examiner, appointed for that purpose by the Board of Examiners;

i. component examination: an assessment of the knowledge, insight and skills of a student in relation to a component within a course, as well as the marking of that assessment by at least one examiner, appointed for that purpose by the Board of Examiners;

j. degree audit:	an assessment by which the Board of Examiners, in accordance with Article 7.10 of the Act, establishes whether all examinations in the various courses that constitute the programme have been successfully completed;
k. Board of Examiners:	the programme's Board of Examiners, which has been installed in accordance with Article 7.12 of the Act;
l. examiner:	the individual who, in line with Article 7.12, section 3 of the Act, has been appointed to set the examinations;
m. Implementation Regulations:	the Implementation Regulations which form part of these Teaching and Examination Regulations;
n. credit/EC:	a credit awarded in line with the European Credit Transfer System (ECTS); one credit denotes a study load of 28 hours;
o. working day:	Monday to Friday with the exception of recognised national public holidays and the collective closure days;
p. study guide:	the digital guide to the programme containing specific information pertaining to the various subjects (www.studiegids.nl);
q. institute:	Delft University of Technology;
r. electronic learning environment:	an electronic system designed for the exchange of teaching information e.g. Brightspace;
s. student registry system:	an electronic system designed for the registration of study progress, e.g. Osiris;
t. disability:	all conditions which are (at least for the specified period) chronic or lasting in nature and which form a structural limitation for the student in receiving education and/or sitting examinations or taking part in practical exercises;
u. IEP:	Individual Exam Programme
v. academic year:	the period from 1 September till 31 August of the following calendar year;
w. bridging programme:	a deficiency programme aimed at moving up to a Master's degree programme, while enrolled in a Bachelor's degree programme, but without obtaining a Bachelor's degree (as stipulated in Article 7.30e or 7.57 of the Act);
x. programme duration:	the duration starting from the enrolment of the student till the last examination.
y. track:	major, as stipulated in Article 7.13, Section 2, Subsection b of the Act.

2. The other concepts in these regulations are used in the sense in which they appear in the Act.

Article 3A – Admission to the Master's degree programme Applied Mathematics (Art. 7.30b WHW)

BoS advisory powers

1. Degrees from Dutch higher education institutions

Individuals holding one of the following degrees have access to the education of the Master's degree programme in Applied Mathematics on the condition that all of the stated requirements have been met.

- Bachelor's degree in Applied Mathematics (Technische Wiskunde) from Delft University of Technology, Eindhoven University of Technology, University of Twente or University of Groningen;
- Bachelor degree in Mathematics (Wiskunde) from a Dutch research university.

Students who possess a Dutch bachelor degree not mentioned above are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admission committee on this matter.

2. Degrees from foreign higher education institutions

Individuals holding a foreign bachelor degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:
- Bachelor degree in Applied Mathematics, and

- a minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (https://www.tudelft.nl/en/education/admission-and-application/msc-international/1-admission-requirements/#c41762).[1] If the country is not listed in the overview, the required minimum CGPA is 75%, and
- English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

The following qualitative admission requirements also apply:
- scores for key subjects must be good,
- To be considered for admission, applicants with a Bachelor degree obtained in India should have either a (minimum) four year Bachelor degree from a mainstream university (state / federal or 'deemed' institution) passed with First Class Distinction – or First Class from one of the Indian Institutes of Technology or Birla Institute of Technology & Science (Pilani).[2]

Next to this candidates are required to submit a CV, two reference letters and a motivation statement.

In case of capacity issues a cap may be installed on non-EER students.

Article 3B – Admission to the Master's degree programme Computer Engineering (Art. 7.30b WHW)

BoS advisory powers

1. Degrees from Dutch higher education institutions

Individuals holding one of the following degrees have access to the education of the Master's degree programme in Computer Engineering on the condition that all of the stated requirements have been met.

- Bachelor's degree in Electrical Engineering or Computer Science & Engineering (Technische Informatica) from Delft University of Technology, Eindhoven University of Technology or University of Twente;
- Bachelor degree in Electrical Engineering from a Dutch HBO institution in combination with a completed bridging programme in Computer Engineering from the TU Delft.

Students who possess a Dutch bachelor degree not mentioned above are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admission committee on this matter.

2. Degrees from foreign higher education institutions

Individuals holding a foreign bachelor degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:

-Bachelor degree in Electrical Engineering or Computer Science, and

-a minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (https://www.tudelft.nl/en/education/admission-and-application/msc-international/1-

[1] More information can be found on the TU Delft website of the respective MSc programmes (for AM: https://www.tudelft.nl/onderwijs/opleidingen/masters/am/msc-applied-mathematics/admission-and-application/).

[2] The reason for the insertion of this separate section is the general difficulty to ascertain the equivalency of BSc degrees from this region with Dutch (or equivalent) BSc degrees. The mentioned criteria should guarantee the admission of sufficiently qualified students.

admission-requirements/#c41762).[3] If the country is not listed in the overview, the required minimum CGPA is 75%, and

-English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

The following qualitative admission requirements also apply:
- scores for key subjects must be good,
- To be considered for admission, applicants with a Bachelor degree obtained in India should have either a (minimum) four year Bachelor degree from a mainstream university (state / federal or 'deemed' institution) passed with First Class Distinction – or First Class from one of the Indian Institutes of Technology or Birla Institute of Technology & Science (Pilani).[4]
- GRE test scores in Verbal Reasoning, Quantitative Reasoning and Analytical Writing. Minimum GRE scores that must be achieved to be eligible for admission are not set, but the Computer Engineering programme looks for applicants who attain a minimum score of 154 for **Verbal Reasoning**, 163 for **Quantitative Reasoning** and 4.0 for **Analytical Writing**. The faculty reserves the right to reject applicants who do not have these scores.

Next to this candidates are required to submit a CV, two reference letters and a motivation statement.

In case of capacity issues a cap may be installed on non-EER students.

Article 3C – Admission to the Master's degree programme Computer Science (Art. 7.30b WHW)

BoS advisory powers

1. Degrees from Dutch higher education institutions

Individuals holding one of the following degrees have access to the education of the Master's degree programme in Computer Science on the condition that all of the stated requirements have been met.

- Bachelor's degree in Computer Science & Engineering (Technische Informatica) from Delft University of Technology, Eindhoven University of Technology or University of Twente;
- Bachelor degree in Computer Science from a Dutch research university;
- Bachelor degree in Electrical Engineering or Applied Mathematics from Delft University of Technology, Eindhoven University or University of Twente and a completed bridging programming in Computer Science & Engineering from TU Delft;
- Bachelor degree Computer Science & Engineering from a Dutch HBO institution(TI) in combination with a completed bridging programme in Computer Science & Engineering from TU Delft.

Students who possess a Dutch bachelor degree not mentioned above are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admission committee on this matter.

2. Degrees from foreign higher education institutions

[3] More information can be found on the TU Delft website of the respective MSc programmes (for CE: https://www.tudelft.nl/onderwijs/opleidingen/masters/ce/msc-computer-engineering/admission-and-application/admission-and-application-for-international-applicants/).

[4] The reason for the insertion of this separate section is the general difficulty to ascertain the equivalency of BSc degrees from this region with Dutch (or equivalent) BSc degrees. The mentioned criteria should guarantee the admission of sufficiently qualified students.

Individuals holding a foreign bachelor degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:

- an academic BSc in Computer Science, and

- a minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (https://www.tudelft.nl/en/education/admission-and-application/msc-international/1-admission-requirements/#c41762).[5] If the country is not listed in the overview, the required minimum CGPA is 75%, and

- English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

The following qualitative admission requirements also apply:
- scores for key subjects must be good,
- To be considered for admission, applicants with a Bachelor degree obtained in India should have either a (minimum) four year Bachelor degree from a mainstream university (state / federal or 'deemed' institution) passed with First Class Distinction – or First Class from one of the Indian Institutes of Technology or Birla Institute of Technology & Science (Pilani).[6]
- GRE test scores in Verbal Reasoning, Quantitative Reasoning and Analytical Writing. Minimum GRE scores that must be achieved to be eligible for admission are not set, but the Computer Science programme looks for applicants who attain a minimum score of 154 for **Verbal Reasoning**, 163 for **Quantitative Reasoning** and 4.0 for **Analytical Writing**. The faculty reserves the right to reject applicants who do not have these scores.

Next to this candidates are required to submit a CV, two reference letters and a motivation statement.

In case of capacity issues a cap may be installed on non-EER students.

Article 3D – Admission to the Master's degree programme Electrical Engineering (Art. 7.30b WHW)

BoS advisory powers

1. Degrees from Dutch higher education institutions

Individuals holding one of the following degrees have access to the education of the Master's degree programme in Electrical Engineering on the condition that all of the stated requirements have been met.

- Bachelor's degree in Electrical Engineering from Delft University of Technology, Eindhoven University of Technology or University of Twente;

- Bachelor degree Electrical Engineering from a Dutch HBO institution in combination with a completed bridging programme in Electrical Engineering;

Students who possess a Dutch bachelor degree not mentioned above are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admission committee on this matter.

2. Degrees from foreign higher education institutions

Individuals holding a foreign bachelor degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:

[5] More information can be found on the TU Delft website of the respective MSc programmes (for CS: https://www.tudelft.nl/onderwijs/opleidingen/masters/cs/msc-computer-science/admission-and-application/admission-and-application-for-international-applicants/).

[6] The reason for the insertion of this separate section is the general difficulty to ascertain the equivalency of BSc degrees from this region with Dutch (or equivalent) BSc degrees. The mentioned criteria should guarantee the admission of sufficiently qualified students.

- Bachelor degree in Electrical Engineering, and
- a minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (https://www.tudelft.nl/en/education/admission-and-application/msc-international/1-admission-requirements/#c41762).[7] If the country is not listed in the overview, the required minimum CGPA is 75%, and
- English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

The following qualitative admission requirements also apply:
- scores for key subjects must be good,
- To be considered for admission, applicants with a Bachelor degree obtained in India should have either a (minimum) four year Bachelor degree from a mainstream university (state / federal or 'deemed' institution) passed with First Class Distinction – or First Class from one of the Indian Institutes of Technology or Birla Institute of Technology & Science (Pilani).[8]

Next to this candidates are required to submit a CV, two reference letters and a motivation statement.

In case of capacity issues a cap may be installed on non-EER students.

Article 3E – Admission to the Master's degree programme Embedded Systems (Art. 7.30b WHW)

BoS advisory powers

1. Degrees from Dutch higher education institutions

Individuals holding one of the following degrees have access to the education of the Master's degree programme in Embedded Systems on the condition that all of the stated requirements have been met.

- Bachelor's degree in Electrical Engineering or Computer Science & Engineering (Technische Informatica) from Delft University of Technology, Eindhoven University of Technology or University of Twente;
- Bachelor's degree in Electrical Engineering or Computer Science & Engineering from a Dutch HBO institution in combination with the completed bridging programme in Embedded Systems.

Students who possess a Dutch bachelor degree not mentioned above are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admission committee on this matter.

2. Degrees from foreign higher education institutions

Individuals holding a foreign bachelor degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:
- Bachelor degree in Electrical Engineering or Computer Science, and
- a minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (https://www.tudelft.nl/en/education/admission-and-application/msc-international/1-

[7] More information can be found on the TU Delft website of the respective MSc programmes (for EE: https://www.tudelft.nl/onderwijs/opleidingen/masters/ee/msc-electrical-engineering/admission-and-application/).

[8] The reason for the insertion of this separate section is the general difficulty to ascertain the equivalency of BSc degrees from this region with Dutch (or equivalent) BSc degrees. The mentioned criteria should guarantee the admission of sufficiently qualified students.

admission-requirements/#c41762).[9] If the country is not listed in the overview, the required minimum CGPA is 75%, and

- English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

The following qualitative admission requirements also apply:
- scores for key subjects must be good,
- To be considered for admission, applicants with a Bachelor degree obtained in India should have either a (minimum) four year Bachelor degree from a mainstream university (state / federal or 'deemed' institution) passed with First Class Distinction – or First Class from one of the Indian Institutes of Technology or Birla Institute of Technology & Science (Pilani).[10]
- GRE test scores in Verbal Reasoning, Quantitative Reasoning and Analytical Writing. Minimum GRE scores that must be achieved to be eligible for admission are not set, but the Embedded Systems programme looks for applicants who attain a minimum score of 154 for **Verbal Reasoning**, 163 for **Quantitative Reasoning** and 4.0 for **Analytical Writing**. The faculty reserves the right to reject applicants who do not have these scores.

Next to this candidates are required to submit a CV, two reference letters and a motivation statement.

In case of capacity issues a cap may be installed on non-EER students.

Article 3F – Admission to the Master's degree programme Sustainable Energy Technology (Art. 7.30b WHW)

BoS advisory powers

1. Degrees from Dutch higher education institutions

Individuals holding one of the following degrees have access to the education of the Master's degree programme in Sustainable Energy Technology on the condition that all of the stated requirements have been met.

- Bachelor's degree in Aerospace Engineering, Applied Earth Sciences, Applied Physics (Technische Natuurkunde), Chemical Engineering (Scheikundige Technologie), Electrical Engineering, Molecular Science & Technology, Maritime Engineering (Maritieme Techniek), or Mechanical Engineering (Werktuigbouwkunde) from Delft University of Technology, Eindhoven University of Technology, or University of Twente;
- Bachelor degree Molecular Science & Technology from Leiden University;
- Bachelor degree in Astronomy (Sterrenkunde), Physics (Natuurkunde), or Chemistry (Scheikunde) from a Dutch research university.

Students who possess a Dutch bachelor degree not mentioned above are required to obtain proof of admission to the programme from the dean, who will seek the advice of the admission committee on this matter.

2. Degrees from foreign higher education institutions

Individuals holding a foreign bachelor degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:

[9] More information can be found on the TU Delft website of the respective MSc programmes (for ES: https://www.tudelft.nl/onderwijs/opleidingen/masters/es/msc-embedded-systems/admission-and-application/admission-and-application-for-international-applicants/).

[10] The reason for the insertion of this separate section is the general difficulty to ascertain the equivalency of BSc degrees from this region with Dutch (or equivalent) BSc degrees. The mentioned criteria should guarantee the admission of sufficiently qualified students.

-Bachelor degree in Aerospace Engineering, Applied Earth Sciences, Applied Physics, Chemical Engineering, Electrical Engineering or Mechanical Engineering, and

-a minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (https://www.tudelft.nl/en/education/admission-and-application/msc-international/1-admission-requirements/#c41762).[11] If the country is not listed in the overview, the required minimum CGPA is 75%, and

-English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

The following qualitative admission requirements also apply:
- scores for key subjects must be good,
- To be considered for admission, applicants with a Bachelor degree obtained in India should have either a (minimum) four year Bachelor degree from a mainstream university (state / federal or 'deemed' institution) passed with First Class Distinction – or First Class from one of the Indian Institutes of Technology or Birla Institute of Technology & Science (Pilani).[12]

Next to this candidates are required to submit a CV, two reference letters and a motivation statement.

In case of capacity issues a cap may be installed on non-EER students.

Article 4 – University entrance examination

Not applicable for MSc.

Article 5A – Goal and final attainment levels of the programme Applied Mathematics (art. 7.13 Section 2, Subsection c WHW)

BoS right of approval

1. This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Applied Mathematics, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

2. Graduates must also meet the specific final attainment levels for this degree programme, as listed below:

1. Is familiar with the existing knowledge in the field of mathematics and its applications, and is competent to extend and develop this independently by means of study.
2. Is able to develop his or her own mathematical knowledge and insights in a focused and methodological fashion.
3. Is able to develop and analyse mathematical models for problems from other disciplines and assess their usefulness.
4. Has a systematic approach, characterized by the application of mathematical theories and development of mathematical methods and models, has a critical attitude.
5. Has knowledge and understanding of mathematical and deductive reasoning necessary for and present in rigorous mathematical proofs and is able to apply this kind of reasoning generically.
6. Can work in a team and is able to communicate mathematical knowledge verbally and in writing to specialists and non-specialists.

[11] More information can be found on the TU Delft website of the respective MSc programmes (for SET: https://www.tudelft.nl/onderwijs/opleidingen/masters/set/msc-sustainable-energy-technology/admission-and-application/admission-and-application-for-international-applicants/).

[12] The reason for the insertion of this separate section is the general difficulty to ascertain the equivalency of BSc degrees from this region with Dutch (or equivalent) BSc degrees. The mentioned criteria should guarantee the admission of sufficiently qualified students.

7. Is aware of the relation between mathematics and its role in society and is able to integrate this awareness while considering technological and societal problems.

Article 5B – Goal and final attainment levels of the programme Computer Engineering (art. 7.13 Section 2, Subsection c WHW)

BoS right of approval

1. This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Computer Engineering, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

2. Graduates must also meet the specific final attainment levels for this degree programme, as listed below:

Computer Engineering is the discipline that embodies the science and technology of design, construction, implementation, and maintenance of software and hardware components of modern computing systems and computer-controlled equipment. Computer Engineering is solidly grounded in the theories and principles of computing, mathematics, science, and engineering and it applies these theories and principles to solve technical problems through the design of computing hardware, software, networks, and processes.

1. *Knowledge.* The Computer Engineering graduate has general knowledge of mathematics, electrical engineering, and computer science and has a profound and broad understanding of computer engineering disciplines, including but not limited to programming, hardware description languages, state-of-the-art computer architectures, methods and algorithms for computer system design, computer arithmetic, compiler construction and code generation, and parallel computers and algorithms.
2. *Design.* The graduate possesses the ability to design computers and computer-based systems that include both hardware and software to solve novel engineering problems, subject to trade-offs involving a set of competing goals and constraints. He or she is capable of utilizing a variety of computer-based and laboratory tools for the design and analyses of computer systems.
3. *Research.* The graduate is able to develop new knowledge and understanding through systematic research. He or she has a creative mindset, which enables him or her to achieve an objective following other than conventional paths. He or she can study recent advances in Computer Engineering, classify recent research articles, and report about it, both verbally and in writing. He or she can define a Computer Engineering research problem, choose a specific approach, and complete a Computer Engineering related research project.
4. *Collaboration.* The graduate is able to work and cooperate in an international and multidisciplinary team. He or she can take on all roles in a project team and handle social dynamics.
5. *Communication.* The graduate can communicate his or her conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously. He or she can do this both verbally and in writing, in the language (English) and terminology of the field.
6. *Learning.* The graduate can reflect and has the learning skills to allow him or her to continue to study in a manner that is largely self-directed or autonomous.
7. *Context.* The graduate understands the professional, societal and ethical context in which engineering is practiced, as well as the effects of engineering projects on society. He or she can take part in debates related to these contexts.

Article 5C – Goal and final attainment levels of the programme Computer Science (art. 7.13 Section 2, Subsection c WHW)

BoS right of approval

1. This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Computer Science, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

2. Graduates must also meet the specific final attainment levels for this degree programme, as listed below:

a. have general knowledge of computer science and the relevant issues of mathematics and computer engineering.
b. have in-depth knowledge in either Software Technology or in Data Science and Technology and have demonstrated the ability to apply it through a Master's thesis project.
c. are able to identify, analyse model and solve problems and to implement and test solutions within their chosen domains for a broad range of application areas.
d. know how to work individually and in teams.
e. are able to analyse and conceptualise at a formal and abstract level.
f. understand the fundamental issues of this field and contribute to research and the further development of the field.
g. position their contributions within the wider scope of the overall development of science and technology, as well as within industry and society.
h. are able to communicate (orally and in writing) about results and methodology to their colleagues in the professional field, as well as to lay audiences.

Article 5D – Goal and final attainment levels of the programme Electrical Engineering (art. 7.13 Section 2, Subsection c WHW)

BoS right of approval

1. This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Electrical Engineering, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

2. Graduates must also meet the specific final attainment levels for this degree programme, as listed below:

1. The electrical engineer is able to contribute his or her specific cognitive and intellectual skills in a multidisciplinary context for a desired external result:
    a. He or she is able to identify technical-scientific and electrical engineering problems arising in professional practice, to place them in context, to formulate them and to communicate about them.
    b. He or she is able to analyse electrical engineering problems and to provide suitable solutions.
    c. He or she is aware of the place and the impact of his or her design activities in respect to the life cycle of the designed product.
    d. He or she is able to report on results and methodology in the language and terminology of the professional field, both verbally and in writing.
2. The electrical engineer has a creative mind-set and has the acquisitive and intellectual skills to adapt to and function within a subfield of the professional domain:
    a. He or she has insight into the nature of physics, so that he or she can study and understand the knowledge gained in this field, in particular as it concerns possible electrical engineering applications.
    b. He or she has deductive skills, gained from the study of mathematical analysis, algebra, and the laws of probability, which enable him or her to analyse problems and deduce new facts.
    c. He or she has in addition the capacity for lateral thinking, which enables him or her to achieve a set goal following other paths than those that are familiar or even well-trodden.
    d. He or she has a representative knowledge of the electrical engineering disciplines and methods, with a focus on mathematical modeling and systems.
    e. He or she has an operational understanding of systems engineering, the discipline that addresses the transformation of an actual market need into a schedule of demands and subsequently into an adequate system configuration through an iterative application of function analysis, synthesis, optimisation, definition, construction, testing, and evaluation.
3. The professional activities of the engineer in the area of Electrical Engineering are grounded in his or her personal and societal functioning:
    a. He or she has insight into both his or her aptitude and his or her interests, and in the effects of his or her actions on societal processes, so that when making choices in his or her

professional domain, he or she can assess what consequences it will have for his or her own and the general well-being.

b. Through his or her actions he or she will promote the societal understanding of the possibilities created by and the results of the practising of his or her profession.

Article 5E – Goal and final attainment levels of the programme Embedded Systems (art. 7.13 Section 2, Subsection c WHW)

BoS right of approval

1. This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Embedded Systems, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

2. Graduates must also meet the specific final attainment levels for this degree programme, as listed below:

1. The graduate has an all-embracing view on embedded systems, their design and their application in systems of various sizes (e.g. from small robots to cyber physical and networked systems) including their evolution over time, demonstrated by an integration approach in system design.
2. He[13] is capable of analysing the functional behaviour of complex embedded systems in a structural way using appropriate abstractions.
3. He is able to describe and study the non-functional aspects of embedded systems, e.g. resource boundedness and dependability.
4. He has a thorough knowledge of state-of-the-art methods and techniques for embedded systems design such as requirements engineering, hardware-software integration, performance modelling and analysis, validation and testing.
5. He is able to design embedded systems that satisfy the functional and non-functional requirements, taking into account the performance of the system during its lifetime. He is also aware of costs and environmental issues making optimal use of the available resources.
6. He has the ability and attitude to include other disciplines or involve practitioners of these disciplines in his work, where necessary. As an engineer he is therefore able to work in a multidisciplinary setting.
7. He is able to conduct research and design independently and has a scientific approach to complex problems and ideas.
8. He possesses intellectual skills that enable him to reflect critically, reason and form opinions.
9. He has the ability to communicate the results of his learning, thinking and decision-making processes at an international level.
10. He is aware of the temporal and social context of science and technology (comprehension and analysis) and can integrate this context in his scientific work.

Article 5F – Goal and final attainment levels of the programme Sustainable Energy Technology (art. 7.13 Section 2, Subsection c WHW)

BoS right of approval

1. This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Sustainable Energy Technology, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

2. Graduates must also meet the specific final attainment levels for this degree programme, as listed below:

[13] "He", "his" or "him" is referring to graduates of any gender.

1. have sufficient theoretical and/or practical skills in more than one specialised area of the discipline to be able to carry out research under general supervision;
2. are able to make connections between and integrate different areas of the discipline;
3. are able to independently analyse research problems, analyse relevant academic literature, formulate testable hypotheses, set up and carry out research and/or draw up and implement draft plans, and can critically reflect on their own research and that of others;
4. have sufficient understanding of the role of science in society to be able to reflect on this and develop an ethical attitude and practice their profession accordingly;
5. have the skills to clearly present their own research results both orally and in writing, to communicate with colleagues and to present their research results at conferences or as (part of) a scientific publication.

In addition, they

1. have mastered Sustainable Energy Technology at an advanced academic level. This means mastery of at least three advanced general subjects (such as Solar Energy, Wind Energy, Biomass Energy, Energy Storage, Sustainable Electrical Power Engineering, Energy and Societal topics) and the necessary skills in the field of experimental techniques, theoretical analysis, simulation and modelling. This knowledge and these skills should be mastered at a level that is considered at least equal to that of other comparable Master's degrees at international, top-quality, educational institutions.
2. have system integration knowledge on at least three areas within Sustainable Energy Technology and in-depth knowledge of at least one area within Sustainable Energy Technology, so that international research literature can be understood.
3. have thorough experience of research in Sustainable Energy Technology and complete awareness of the applicability of research in technological developments.
4. are capable of understanding a wide variety of different problems and are able to formulate these at an abstract level, whilst being able to see the relation between diverse problems at this abstract level and to contribute creatively to their solution, focusing on practical applications.
5. are capable of creating innovative technical designs, taking feasibility issues into account.
6. are capable of working in a (preferably interdisciplinary) team of experts, performing the aforementioned activities and communicating easily in both written and spoken English.
7. are capable of working independently and taking initiatives where necessary, identifying areas where expertise is lacking and are able to resolve the situation.
8. are capable of making an English and native language presentation of personal research activities to varied audiences, while being capable of adapting to the background and interest of the audience.
9. have knowledge of sustainable energy-related developments in society and are capable of developing and defending opinions in this area.

Article 6 – Track (Art. 7.13 Section 2, Subsection b WHW)

BoS right of approval

The Master's degree programme has the tracks as stated in the Implementation Regulations for the specific study programme.

Part 2 Composition of the degree programme and the degree audit

Article 7A – Composition of the degree programme and the degree audit (Art. 7.13 Section 2, Subsections a, e, g and x of the WHW)

BoS advisory powers (a, x); right of approval (e and g)

FSC right of approval (x)

1. The composition of the degree programme and the relevant transitional regulations are laid down in the Implementation Regulations in the annex.

2. The programme includes the Master's degree audit, with a study load of 120 credits. Subsection e and g
3. Following approval from the two Boards of Examiners concerned, a student may take an individual double degree programme in which two Master's programmes are combined simultaneously to create a programme of at least 180 credits. Upon completion the student is awarded two Master's diplomas. The student must earn at least 60 unique credits for each Master's degree programme.
4. Subjects that were part of the Bachelor's degree programme that qualified a student for admission to the Master's degree programme may not be included in the Master's degree programme. If a compulsory component has already been completed in the aforementioned Bachelor's degree programme, the Board of Examiners will designate an alternative subject. If an elective module of the degree programme has already been completed in the aforementioned Bachelor's degree programme, the student will select an alternative elective module. Subsection a
5. The Master's degree audit is concluded with a final test or assignment. This test or assignment demonstrates that the student possesses and is able to apply the knowledge, insight and skills acquired in the degree programme. Subsection a
6. The degree programme is described in the digital study guide, along with the subjects, including the study load, number of contact hours and form of examination of each subject, as well as the programming of the examination and the language. Subsection e and x
7. The actual design of the education is elaborated in greater detail in the study guide. Subsection x

Article 7B – Flexible exam programme

1. According to article 7.3d of the law on Higher Education and Research, students can draw up a flexible exam programme that will lead to an examination.
2. Unlike the IEP referred to in Article 4 of the Implementation Regulations, the flexible exam programme has to be submitted by the student for approval to the Board of Examiners in advance, that is, before commencement of the intended Master's degree programme.

Article 8 – Form of the programme (Art. 7.13 Section 2, Subsection i WHW)

FSC right of approval, BoS advisory powers

All programmes are offered exclusively on a full-time basis.

Article 9 – Language (Art. 7.2 WHW)

FSC right of approval, BoS advisory powers

Courses are taught in English and examinations and final examinations are administered in English.

Part 3 Honours Programme and other annotations

Article 10A – Honours Programme

FSC right of approval, BoS advisory powers

1. Students who have shown an excellent performance during the first semester (no fails and a weighted average mark of 7.5 out of ten or higher) will be invited to register for the Delft University of Technology Honours programme for outstanding Master's students (HPM):
2. Based on the above criterion and their HPM proposal (see website for template) with their project description, students will be selected and admitted to the HPM by the director of studies or an HPM coordinator or HPM committee established by the director of studies.
3. Students can only apply for the extra honours programme during the first year of their master programme.
4. The HPM will comprise at least 20 credits:
    a. At least 5 credits must be completed in the Delft University of Technology-wide component of the HPM, which consists of:

- the subject UD2010 Critical Reflection on Technology

b. At least 15 credits must be completed in the faculty component of the HPM, the composition of which (including its content and options) is described on the faculty website.

5. Any student selected for participation in the HPM must submit his or her options for the faculty component to the Board of Examiners and the director of studies or the HPM coordinator or the HPM committee for approval.
6. The Board of Examiners will be responsible for assessing whether all the requirements of the HPM have been met.
7. Any student who has successfully completed the HPM and his or her Master's programme will be awarded a certificate signed by the chair of the Board of Examiners and the Rector Magnificus.

Article 10B – Technology in sustainable development annotation[14]

Students may choose to focus their Master's on Technology in Sustainable Development. If this annotation on Technology in Sustainable Development is to be entered on a student's diploma supplement, the following units of study must, at minimum, have been attended:

1. A colloquium in sustainable development (WM0922) worth 4 EC.
2. Four study units provided by the faculty or elsewhere within the Delft University of Technology, each representing no fewer than 3 EC. These study units shall be chosen from the following clusters:
   a. Design, Analysis and Tools (at least 5 EC)
   b. Organisation, Policy and Society (at least 5 EC)

   Further information on the available units of study can be obtained from the lecturer in sustainable development.
3. The thesis project as specified in the Implementation Regulations should be devoted to sustainable development. The contact person shall supervise the problem formulation of the project, the execution of the project and the project report with respect to the topic of sustainable development.

Article 10C – Entrepreneurship annotation[15]

This programme is especially tailored for students who want to start a company after completing their master's education. It consists of:

1. Obligatory Entrepreneurship Modules (15 credits),
2. Entrepreneurship electives (5-10 credits)

The programme should be approved by the coordinator.

Article 10D – Quantum technology annotation[16]

The Quantum Technology annotation consists of a set of 20ec of compulsory course modules,

a graduation project focussed on quantum technology (Software & Theory, Hardware & Experiment, Quantum Computer Engineering, Quantum Materials) and additional work approved by the coordinator of the annotation; for more information see the website of Qutech. The requirements for the Quantum Technology annotation are:

[14] Not for students in the Master's programme in Sustainable Energy Technology.
[15] For students in the Master's programme in Computer Engineering, Computer Science, Electrical Engineering, Embedded Systems and Sustainable Energy Technology.
[16] Available to students in the MSc programmes Electrical Engineering, Computer Engineering, Computer Science and Embedded Systems. Students should consult with the respective MSc coordinator of their programme beforehand.

*The **thesis project** (ET4300, IN4600/IN4610, IN5000) must be focussed on quantum technology (Software & Theory, Hardware & Experiment, Quantum Computer Engineering, Quantum Materials).*
AP3421, Fundamentals of Quantum Information, 4EC
CS4090, Quantum Communication and Cryptography, 5EC
AP3292, Quantum Hardware, 6EC
EE4575, Electronics for Quantum Computation, 5EC
Annotation Extras – at least one of three options: A. Quantum Information Project (AP3421-P, 2EC). B. Focus course: Special Topics in Quantum Technology (AP3662, 3EC). C. Quantum Technology Annotation Assignment (AP3942, 0EC) - Participation in company visits with challenging group and personal assignments and/or additional effort for QuTech Academy.

Article 11 – (Compulsory) participation in the programme (Art. 7.13 Section 2, Subsection t WHW)

FSC right of approval, BoS advisory powers

1. All students are expected to participate actively in the courses for which they are registered.
2. If necessary, there will be an obligation to participate in practical exercises, with a view to admission to the related examination, without prejudice to the authority of the Board of Examiners to grant an exemption from this obligation, with or without imposing a substitute requirement.
3. Any supplementary obligations are described by component in the course description.

Article 12 – Evaluation of the study programme (Art. 7.13 Section 2, Subsection a1 WHW)

BoS right of approval

1. The Director of Studies ensures the implementation of the evaluation of the education.
2. The manner in which the education in the programme is evaluated is documented in the faculty's Quality Assurance Manual, which is submitted to the Faculty Student Council and the Board of Studies.
3. The Director of Studies informs the Board of Studies concerning the outcomes of the evaluation, the intended adjustments based on these outcomes and the effects of the actual adjustments.

Part 4 Registering and withdrawing

Article 13 – Registration for written examinations

FSC right of approval; BoS advisory powers

1. Registration to take part in a written examination is compulsory and is done by entering the required data into Osiris no later than 14 calendar days (not *working* days) before the examination. Students receive examination tickets by email as confirmation of their registration.
2. Students who have not registered within the term specified in Section 1 may request registration for that examination after this term until no later than 3 calendar days before the examination in question, by entering the requested data into Osiris. The request will be honoured providing that places are available in the room or rooms where the examination is scheduled to take place. Students receive examination tickets by email as confirmation of their registration.

3. In the case of circumstances beyond a student's control, whereby the student is unable to register for the examination, the Board of Examiners can still permit the student to participate in the examination.
4. A student who has not registered for the examination and is therefore not included on the list of participants, may report to the invigilator on the day of the examination from 15 minutes before until the start of the examination. In so far that there are seats available, they will be admitted to the examination room 30 minutes after the start of the examination in the order they reported to the invigilator. The lack of 30 minutes examination time cannot be compensated. Students who have thus gained access to the exam will be added to the list of participants. The student takes the examination subject to the reservation that it will be investigated whether he/she is entitled to participate in the examination.
5. In case the investigation leads to the conclusion that the student was not entitled to participate in the examination, the examination work is invalid, will not be evaluated and does not lead to a result.
6. The student can submit a substantiated request to the Board of Examiners to have examination work that is considered to be invalid to be declared valid and to have it assessed.
7. The Board of Examiners will only agree to the request in exceptional circumstances.

Article 14 – Registration for other examinations and practical exercises

FSC right of approval; BoS advisory powers

1. Registration for participation in an examination other than a written examination or registration for a practical exercise will take place in the manner and by the deadline indicated in the study guide for the examination or practical exercise in question.
2. In special cases the Board of Examiners may deviate from the period of registration referred to in section 1, however only in favour of the student.
3. Students who have not registered on time will not be allowed to participate in the examination or practical exercise. In exceptional circumstances the Board of Examiners may allow the student to participate in the examination or practical exercise.
4. If a student participates in an examination or practical exercise for which the student was not properly registered, the Board of Examiners can declare the results of the examination or practical exercise to be invalid.

Article 15 – Withdrawal written examination

FSC right of approval; BoS advisory powers

1. It will be possible to withdraw from an examination via the student registry system up to 3 working days before the examination takes place.
2. Any student who has withdrawn from an examination should re-register on a subsequent occasion, in accordance with the provisions of Article 13.

Part 5 Examinations

Article 16 – The form of examination and method of assessment in general (Art. 7.13 Section 2, Subsections h and l WHW)

FSC right of approval, BoS advisory powers

1. The examinations are set as described in the study guide. Practical skills are tested during the hours allocated for practical training.
2. The form of the examinations is specified in the study guide before the start of the concerned semester.
3. A student may participate in an examination for a subject no more than twice in one academic year.

4. If there is no indication as to the way an examination is to be set because it relates to a course not taught by the programme itself, the relevant stipulations in the study guide of the relevant programme will apply.
5. The Board of Examiners may deviate from the provisions of sections 1 to 3, in favour of the student.

Article 17A – Times and number of examinations (Art. 7.13 Section 2, Subsection j WHW)

FSC right of approval, BoS advisory powers

1. Two opportunities to take written examinations will be offered each academic year:
   - the first opportunity is immediately after the teaching period for the course to which the examination in question relates,
   - the second opportunity is at the end of the subsequent teaching period, or else during the resit period in July or August during the same academic year.
2. The frequency of examinations is laid down in the Implementation Regulations. A timetable of all the opportunities to sit written examinations is drawn up on an annual basis and distributed before the start of each semester.
3. If absolutely necessary, changes can be made to this examinations' timetable but only with the approval of the Board of Examiners and if the changes are communicated to students through the official means of communication (the electronic learning environment) at least 4 weeks in advance. In case of force majeure, deviation from this period is allowed, only by decision of the Board of Examiners.
4. If an examination is part of a course not offered by the faculty of EEMCS the relevant stipulations in the Teaching and Examination Regulations of the relevant programme will apply. The Board of Examiners reserves the right to make decisions that deviate from the norm regarding this matter.
5. Notwithstanding the provisions of section 1, there will be at least one chance in a year to sit examinations relating to courses not taught in a given academic year.
6. In exceptional cases, the Board of Examiners may permit more than two opportunities in a year for certain examinations.

Article 17B – Sequence of examinations

1. If there is a fixed sequence in which students are required to sit examinations and participate in practical exercises, this will be laid down in the Implementation Regulations.
2. If there are entry requirements for a course these are specified in the study guide before the start of the education period in which this course is offered.

Article 18 – Oral examinations (Art. 7.13 Section 2, Subsection n WHW)

FSC right of approval, BoS advisory powers

1. Only one student at a time will sit an oral examination, unless the examiner in question specifies otherwise.
2. Preferably, an oral exam will take place with two examiners and anyhow when it is requested by the student. A request to this end has to be submitted to the lecturer at least 7 days before the exam.
3. Oral examinations will be held in public, unless determined otherwise by the Board of Examiners in a special case or unless the student has formally objected to the public nature of the examination.
4. The student must be able to provide proof of identity prior to an oral examination.

Article 19 – Determining and announcing the results (Art. 7.13 Section 2, Subsection o WHW)

FSC right of approval, BoS advisory powers

1. The examiner is required to determine and publish the result of an oral examination within 48 hours after the moment it is finished.
2. The examiner determines the result of a written examination as quickly as possible but by no later than 15 working days after the examination. The results of written interim examinations shall be announced no later than five working days before the next written interim examination.
3. The examiner ensures that the results are registered and communicated in Osiris (if applicable) within the time frame mentioned under sub 2, taking due account of the student's right to privacy.
4. In case of a practical exercise, the examiner is required to determine the result as soon as possible after the last due date on which (the last part of) the practical exercise was to be handed in, but within 15 working days at most. The examiner ensures that the results are registered and communicated in Osiris (if applicable) within this time frame, taking due account of the student's right to privacy.
5. If the examiner is not able to meet the previously mentioned requirements due to exceptional circumstances, he or she must inform the Board of Examiners, stating the reasons for the delay and informs the students as soon as possible.
6. Regarding any examinations that are not taken orally, in writing or as a practical exercise, the Board of Examiners shall determine beforehand precisely how and within which period of time the student will be notified of the results.
7. When receiving the result of an examination, the student will be made aware of his or her right to inspect the results as referred to in Article 20, as well as the opportunity to lodge an appeal with the Examination Appeals Board.

Article 20 – The right to inspect the results (Art. 7.13 Section 2, Subsection p WHW)

FSC right of approval, BoS advisory powers

1. For a period of at least 20 working days after notification of the results of any written examination, the student has the right to inspect his or her marked work. On request students will be supplied with a copy of the marked work.
2. During the period referred to in section 1, all students who have sat the examination may acquaint themselves with the questions and assignments set in the examination, as well as with the criteria used for marking.
3. The Examiner may determine that the right to inspection or perusal referred to in sections 1 and 2 will take place at a location specified beforehand and at a time also specified beforehand.
4. If the student can prove that he/she is or was unable to be present at the location at the set time due to circumstances beyond his or her control, then another opportunity will be provided, if possible within the period stated in section 1. The location and times mentioned in the first sentence will be announced well in advance.

Article 21 – Discussing the examination results (Art. 7.13 Section 2, Subsection q WHW)

FSC right of approval, BoS advisory powers

1. For a period of 20 working days after the results have been announced, students who have taken a written examination may submit a request to discuss the results with the relevant examiner. This discussion will take place within a reasonable time span and at a place and time determined by the examiner.
2. As soon as possible after the results of an oral examination have been announced, an opportunity is arranged to discuss the results, either at the student's request or at the instigation of the examiner. At this meeting, the reasons behind the marks awarded will be explained.
3. In cases where a collective discussion is organised by or on the instructions of the examiner, a student may only submit a request, as described in the preceding section, if he/she was present at the collective discussion and if he/she provides a good reason for the request or if, due to circumstances beyond his/her control, he/she was unable to attend the collective discussion..
4. The Board of Examiners may permit departures from the provisions of sections 2 and 3.

Article 22A – Validity of examinations (Art. 7.13 Section 2, Subsection k, Art. 7.10, Section 4 WHW)

FSC right of approval, BoS advisory powers

1. The result of a final grade[17] is valid for an unlimited period. The Dean can restrict the period of validity of a successfully completed examination only if the knowledge or insight that was examined has become outdated or if the skills that were examined have become outdated.
2. In cases involving a limited period of validity based on the first section, the period of validity shall be extended at least by the duration of the acknowledged delay in studies, based on the TU Delft Profiling Fund Scheme.
3. In individual cases involving special circumstances, the Board of Examiners can extend periods of validity that have been limited based on the first section or further extend periods of validity that have been extended based on the second section.
4. If a subject consists of interim examinations, the period of validity of the interim examination for which no credits are assigned shall be restricted to that academic year.

Article 22B – Invalidation examination or part thereof (art. 7.12 and 7.12b WHW)

FSC right of approval, BoS advisory powers

The Board of Examiners is entitled to invalidate an examination or part thereof, if it has not been reasonably possible to properly assess the knowledge, insight and/or skill of the student on the examination or part thereof.

Part 6 Exemptions

Article 23 – Exemption from examinations or obligation to participate in a practical exercise (Art. 7.13 Section 2, Subsection r WHW)

FSC right of approval, BoS advisory powers

1. After having been advised by the relevant examiner, the Board of Examiners may decide to exempt students from an examination on the grounds of:
   a. an examination involving a unit of study that, in terms of content and study load, was equivalent to a comparable university course in the Netherlands or beyond, or
   b. an examination, final examination completed within the Dutch higher education system or elsewhere which, as regards content and study load, corresponds with the examination for which exemption is sought, or
   c. proof of knowledge and/or skills acquired outside the higher education system.
2. After having obtained recommendations from the relevant examiner, the Board of Examiners may grant exemption from the requirement to participate in a practical exercise with a view to admission to the related examination, possibly subject to alternative requirements.

Part 7 Degree Audit

Article 24 – Periods and frequency of degree audits (Art. 7.13 Section 2 WHW)

FSC right of approval, BoS advisory powers

1. In principle, the opportunity to take the Master's degree audit will be offered once each month. The dates set by the Board of Examiners are published before the start of the academic year.

[17] Meaning a result or several partial results which has or have been registered in the student registry system in such a way that credits are allocated for the course.

2. All students can apply to take the degree audit as soon as they have fulfilled the conditions of their programme, and have provided the Student Programme Administration office with proof of the programme components they have passed. An additional condition of the programme's is to submit the thesis report to the repository of the Delft University of Technology Library, except for possible parts with an obligation of secrecy towards the originator of the project.

Part 8 Studying with a disability

Article 25 – Adjustments to the benefit of students with disabilities or chronic illnesses (Art. 7.13 Section 2, Subsection m WHW)

FSC right of approval, BoS advisory powers

1. Students with disabilities or chronic illnesses may be eligible for adjustments in teaching and examinations, on written request. These changes will be geared as much as possible to a student's individual needs, but they must not affect the quality or the degree of difficulty of a course or an examination programme. The facilities provided to this end may involve adapting the form or duration of examinations and/or practical exercises to the student's individual situation or making practical aids available.[18]
2. The application referred to in the preceding section has to be submitted by the student within five weeks after the start of studies or within five weeks after the discovery of the disability.
3. The request referred to in section 1 should be accompanied by a recent medical certificate from a doctor or a psychologist. If there is evidence of dyslexia, the request should be accompanied by a document issued by a recognised dyslexia-testing bureau (i.e. registered with BIG, NIP, or NVO). If possible, this certificate should also estimate the extent to which the disability forms an obstacle to study progress.
4. Requests for the adaptation of teaching facilities will be decided upon by the dean or by the director of studies acting on the dean's behalf. The Board of Examiners will decide on requests for adaptations to examinations.

Part 9 Study progress checks and reporting

Article 26 – Study support and Monitoring of student progress (Art. 7.13 Section 2, Subsection u WHW)

FSC right of approval, BoS advisory powers

1. The Dean is responsible for providing individual study supervision to students registered for the degree programme, partly for their orientation towards potential study options within and outside the degree programme. He will also ensure that effective support and supervision is provided to students in making choices related to their studies.
2. The examination and study programme applying to each student is documented in Osiris.
3. The Student Programme Administration is responsible for ensuring that all students are able to review and check their results in the Osiris student-information system.

Article 27A

Not applicable

Article 27B

Not applicable.

[18] More information and examples of adjustments to examinations can be found here: https://www.tudelft.nl/studenten/begeleiding/career-counselling-services/studentendecanen/studeren-met-een-functiebeperking/

Part 10 Contravention, changes and implementation

Article 28 – Contravening the regulations

If the study guide and/or any other regulations relating to the exam programme and/or the examination programme prove to contravene these Teaching and Examination Regulations and the accompanying Implementation Regulations, precedence will be given to the provisions of these Teaching and Examination Regulations in combination with the Implementation Regulations.

Article 29 – Changes to the regulations

1. Any changes made to these regulations will be made by special resolution of the dean.
2. No changes made will affect the current academic year unless it is reasonable to suppose that the interests of students will not be adversely affected.
3. No change made to these regulations may negatively affect any previous decisions concerning a student that are made by the Board of Examiners on the basis of these regulations.

Article 30 – Transitional regulations

1. If the composition of the exam programme undergoes intrinsic changes or if these regulations are amended, the dean will draw up transitional regulations that will be incorporated into the Implementation Regulations.
2. Such transitional regulations are required to include:
   a. a provision concerning the exemptions that can be given on the basis of examinations already passed;
   b. a provision specifying the period of validity of the transitional regulations.
3. If a course is removed from the exam programme, e.g. due to a new programme, four opportunities to sit an examination in this course will be granted after the last classes have been taught: an examination in the last teaching period of the course, a resit in the same academic year, and two resits in the subsequent academic year.
4. If a new exam programme is drawn up for a certain year of study, students that started before that year may change their IEP with the understanding that they include either all compulsory parts of the old programme or all compulsory parts of the new programme. Any change in the IEP needs the approval of the Board of Examiners.
5. Students with an approved IEP may complete this programme, in so far as courses are available. In the case where courses are no longer available, they may be substituted by existing courses according to the relevant course equivalencies as stated in the appendix (part 3). However, the total number of EC of the IEP must be at least 120 EC. Any change in the IEP that is not covered by the course equivalencies in part 3 of the appendix needs the approval of the Board of Examiners.
6. If it is no longer possible to complete an exam programme, students must submit a new IEP according to the exam programme described in the current Implementation Regulations.

Article 31 – Publication of the regulations

1. The dean is responsible for finding a suitable way of publicising these regulations and the relevant Implementation Regulations, the transitional regulations defined in part 3 of the appendix, as well as any changes to the regulations.
2. The Teaching and Examination Regulations, together with the accompanying Implementation Regulations, will always be published on the programme's website.

Article 32 – Entry into force

These Regulations and their appendix will come into effect on September 1, 2019.

Issued by the dean of the Faculty on August 20, 2019, after the approval and recommendations of the Faculty Student Council and the Board of Studies for Applied Mathematics, Computer Science, Electrical Engineering, Embedded Systems, Computer Engineering, Sustainable Energy Technology and the Board of Examiners of EEMCS.

Appendix: Implementation Regulations

Part 1 General

Article 1 – Study load and duration

Each Master's degree programme has a duration of two years (120 credits) and starts annually in September. It is also possible to start the Master's degree programme in the second semester, but students are advised that there might be dependencies on first semester courses. This could limit the choice of courses to be followed by students who start the Master's programme in the second semester.

Article 2 – Programme structure

1. Each Master's degree programme comprises the following components[19]:
   a. Core courses, which provide the basic knowledge required for all students in the Master's degree programme. Core courses are prescribed by each Master's degree programme.
   b. Courses aimed at providing students with the opportunity to specialise and to prepare for their thesis project (see subsection d). Such courses may be prescribed, chosen from a fixed list or elected freely.
   c. Courses aimed at removing deficiencies, the extent of which to be limited by the study programme.
   d. A thesis project that serves as final assessment of the student (ref. article 3).
2. Each semester the dean issues lists of all courses offered to the students of the faculty. The lists with these courses are published in the study guide.

Article 3 – The thesis project

1. The thesis project is the last study unit of the programme and serves to prove that the student has acquired the academic competencies of a Master of Science. The project involves a research or design task with sufficient academic level. The project may be executed within a research programme at Delft University of Technology, or in a suitable research institute or company. The project must be executed with a systematic approach and should include all phases of a research or design project: problem formulation, analysis, modelling, implementation/construction and validation/evaluation. The student executes the thesis project independently, with guidance of one or more thesis supervisors, at least one of them from the scientific staff of Delft University of Technology.
2. The thesis projects[20] of the programmes are governed by the EEMCS Graduation Policy (MSc). This requires that a student obtains a Thesis Entrance Permit (TEP) before embarking on the thesis project. In order to obtain a TEP, at least 60 credits of the Master's degree course work as stated in their IEP should be completed.
3. The thesis project of the programme in Sustainable Energy Technology is also governed by the EEMCS Graduation Policy (MSc), but differs for students from cohorts before 2017-2018: these students may start the Master thesis project after completion of 45 EC of theoretical courses. This means that the industrial internship and the projects ET4380SET and SET3811 are excluded.

   With regard to the thesis project, the thesis supervisor may impose additional conditions to be met before starting the thesis project.

[19] Nomenclature may differ.
[20] Except the thesis project of the 3TU Master's programme in Sustainable Energy Technology of students from cohorts before academic year 2017-2018. These students may start the Master thesis project after completion of 45 EC of theoretical courses. This means that the industrial internship and the projects ET4380SET and SET3811 are excluded.

5. The thesis project and resultant thesis report should comprise original work carried out by the student as part of the Master's programme.
6. Students may present and defend their thesis work only after they have finished all courses as stated in their approved IEP.[21]

Article 4 – Individual exam programme (IEP)

1. Students draw up their IEP according to the programme structure described in article 2 and the stipulations of the relevant programme, in consultation with the Master coordinator and the IEP reviewer appointed by the head of the EEMCS research group where the student plans to perform his or her thesis project.
2. Students must submit their IEP for approval by the Board of Examiners before the start of the fourth quarter of the first year.
3. If the contents of a compulsory course correspond to a large degree to the course contents of one or more courses followed in a prior exam programme, a student can apply for exemption from the compulsory course. It must be replaced by a specialisation course[22], with at least the same number of credits.
4. If the student has completed a TU Delft MicroMasters (equivalent to 18 credits), the student may be exempted from the courses in the connecting Master's programme without the number of credits (depending on the student's IEP 0 to 18) having to be replaced. This is the case for the MicroMasters programme Solar Energy Engineering, which is connected to the programmes Sustainable Energy Technology and Electrical Engineering, track Electrical Power Engineering. The Board of Examiners may ask for an additional proof of competence in order to grant an exemption.

Article 5 – Examination requirements

From Rules and Guidelines of the Board of Examiners (art. 7.12 W.H.W.), Delft University of Technology, Faculty of Electrical Engineering, Mathematics and Computer Science:

The student meets the requirements for the degree audit once the following have been met:

1. *a. a result has been earned for all subjects: a mark, a pass (v) or an exemption (vr):*
   b. none of the marks may be lower than 6.0
2. *The method of assessment will be transparent so that the student can ascertain how the result was reached.*
3. *In special cases the Board of Examiners may deviate from the provisions of section 1. It will stipulate additional requirements if necessary.*

The examination requirements for special programmes such as Erasmus Mundus of EIT programmes are stated with the programme details of the relevant programmes.

Article 6 – Completion of bridging programme prior to the degree programme

1. A student who is enrolled in a Bachelor's degree programme for a bridging programme with the aim of being admitted to the degree programme at TU Delft, must complete this bridging programme within two academic years,
2. In case a student fails to complete the bridging programme within the period specified in section 1 of this article, his enrolment is terminated. Under exceptional personal circumstances the student can submit a well-founded request for an extension of the course duration for a period of at most twelve months.
3. The Executive Board will set the fee to be charged, as denoted in Article 7.57i of the Act, for the enrolment as student in a bridging programme and for the extension thereof, as denoted in section 2 of this article.

[21] Except the thesis project of the 3TU Master's programme in Sustainable Energy Technology of students from cohorts before academic year 2017-2018. These students may present and defend at an earlier time.
[22] For the MSc programme Sustainable Energy Technology (SET) an elective course can be chosen (as there is no mention in this programme of specialisation courses).

Part 2A Applied Mathematics

Article 7 – General

1. The Master's Degree Programme in Applied Mathematics has five specialisations and is described in article 8A:
    a. Analysis (An),
    b. Computational Science and Engineering (CSE),
    c. Financial Engineering (FE),
    d. Optimisation (Opt).
    e. Stochastics (Sto),

2. An IEP consists of the following parts:
    a. Core courses worth 24 credits,
    b. Specialisation courses worth at least 36 credits, of which
        - a maximum of 6 credits may be spent on non-mathematical courses and
        - at least 6 credits must be spent on *MasterMath* (MM) courses[23].
    c. Non-mathematical electives worth 12 to 18 credits,
    d. A thesis project worth 42 credits.
3. During their education students are required to gain experience as a mathematician outside the institute. For students who perform their thesis project at the Delft Institute of Applied Mathematics this requirement must be fulfilled through a compulsory internship of 12 or 18 credits as part of the non-mathematical electives.
4. The joint Master's Programme in Computer Simulations for Science and Engineering (COSSE) deviates and is described in article 8B.
5. Students who have followed the Minor Science Education and Communication (SEC) in their Bachelor's programme and wish to obtain the certificate granting 1st degree teacher (eerstegraads bevoegdheid) status in the Netherlands may follow the SEC specialisation (Verdiepingsdeel) at the faculty of Applied Science within their Applied Mathematics Master's programme.

Article 8 – Programme details

Article 8A – Applied Mathematics

1. The core consists of two parts, the general part (6 credits)[24] and the mathematics part (18 credits).

    a. The general part consist of the following compulsory courses:

Code	*Course name*	*EC*
TPM005A	Scientific Writing for Applied Mathematics.	3
WM1028AM	Ethics for Applied Mathematics	3

    b. The mathematics part consists of three of the following courses, of which some are compulsory for certain specialisations:

Code	*Course name*	*EC*	*Compulsory for:*
WI4201	Scientific Computing	6	Computational Science and Engineering, Financial Engineering
WI4203	Applied Functional Analysis	6	Analysis

[23] For the Mastermath course examinations, separate mastermath rules apply. For more details see the following link https://elo.mastermath.nl/pluginfile.php/220/mod_page/content/22/20170824%20Rules%20and%20Guidelines%202017-2018.pdf

[24] Students who follow the SEC specialisation may replace the general part by 6 credits worth of courses of this specialisation.

WI4227-14	Discrete Optimisation	6	Optimisation
WI4430	Martingales, Brownian Motion and Stochastic Calculus	6	Financial Engineering, Stochastics
W4455	Statistical Inference	6	Stochastics

2. The specialisation courses consist of 36 credits worth of compulsory and/or recommended courses as stated in the related lists below. Additionally, students may also use all courses under subsection 1b as specialisation courses. Unlisted courses may be submitted to the Board of Examiners for approval.

Specialisation courses for Analysis

Choose at least three from the list of recommended mathematics courses:

Code	*Course name*	*EC*
WI4006	Special Functions and Representation Theory[25]	6
WI4046	Spectral Theory of Linear Operators[26]	6
WI4210	Functional Analysis and PDE	6
WI4211	Advanced Topics in Analysis	6
WI4520	Mathematics of Fluid Dynamics	6
WI4485	Harmonic analysis[27]	6
WI4480	Internet Seminar on Evolution Equations	9
WI4500	Quantum Information Theory	6
WI4129	Stochastic Differential Equations	6
(MM-GQT)	Lie Groups and Lie Algebras	8
(MM-GQT)	Differential Geometry	8
(MM)	Operator Algebras	8

Specialisation courses for Computational Science and Engineering

Compulsory for all students in the specialisation:

Code	*Course name*	*EC*
WI4019	Nonlinear Differential Equations	6
WI4204	Advanced Modeling in Science	6
WI4205	Applied Finite Elements (MM-4TU)	6

The following mathematics courses are recommended:

Code	*Course name*	*EC*
WI4011-17	Computational Fluid Dynamics	6
WI4475	Data Assimilation	6
WI4226	Advanced Systems Theory	6
WI4207	Continuous Optimization	6
WI4212	Advanced Numerical Methods	6
WI4450	Special Topics in Computational Science and Engineering	6
WI4231	Mathematical Data Science	6
WI4495	Perturbation Methods	6
WI4209	Systems and Control (MM-4TU, -DISC)	6
WI4420	Continuum Mechanics[28] (MM-4TU, NDNS+)	8

[25] Offered only in even years.
[26] Offered only in even years.
[27] Offered only in uneven years.
[28] Offered only in uneven years.

WI4221	Control of Discrete-Time Stochastic Systems	6

The following non-mathematics courses are recommended:

Code	*Course name*	*EC*
IN4049TU	Introduction to High Performance Computing	6
WI4260TU	Scientific Programming for Engineers	3
WI4265TU	Parallel Programming	3

Specialisation courses for Financial Engineering:

Compulsory for all students:

Code	*Course name*	*EC*
WI4425	Financial Markets Theory	6
WI4079	Financial Mathematics	6
WI4154	Computational Finance	6

The following mathematics courses are recommended:

Code	*Course name*	*EC*
WI4019	Nonlinear Differential Equations	6
WI4231	Mathematical Data Science	6
WI4230	Time series and Extreme Value Theory	6
WI4052	Risk Analysis	6
WI4156(TU)	Game Theory	6
WI4205	Applied Finite Elements (MM-4TU)	6
WI4224	Special Topics in Financial Engineering	6
WI4505	Quantative Risk Management	6
WI4614	Stochastic Simulation	6
WI4435	Nonparametric Statistics [29]	6
MM	MasterMath Applied Statistics TUD version[30]	6
MM	MasterMath Applied Statistics TU/e version	6
MM	MasterMath Applied Statistics UT version	6

Specialisation courses for Optimisation:

Each student should choose at least three of the following courses

Code	*Course name*	*EC*
WI4410	Advanced Discrete Optimization	6
WI4515	Relaxations and Heuristics	6
WI4490	Convex analysis and Optimization	6
Mastermath	Semidefinite Optimization	8

The following mathematics courses are recommended:

Code	*Course name*	*EC*
WI4207	Continuous Optimization	6
WI4231	Mathematical Data Science	6
WI4614	Stochastic Simulation	6

[29] May not be combined with MasterMath Applied Statistics TUD version.
[30] May not be combined with WI4435 Nonparametric Statistics.

WI4500	Quantum Information Theory*	6
MM-Diamant	Additive Combinatorics	8
MM-STAR	Machine Learning Theory	8
MM	Quantum Computing	
MM	Quantum Information Theory*	8
MM-LNMB	Scheduling	6
MM-Diamant	Probabilistic and Extremal Combinatorics	8
MM- Diamant	Algorithms Beyond the Worst Case	8

*Either WI4500 Quantum Information Theory or MM Quantum Information Theory

Non-mathematics courses are advised upon request by the chair of the Optimization group.

Specialisation courses for Stochastics:

Choose at least four from the list of courses:

Code	*Course name*	*EC*
WI4231	Mathematical Data Science	6
WI4230	Time series and Extreme Value Theory	6
WI4052	Risk analysis	6
WI4156(TU)	Game theory	6
WI4050	Uncertainty and sensitivity Analysis	6
WI4138	Decision Theory/Expert Judgment	6
WI4225	Interacting particle systems: theory and applications[31]	6
WI4614	Stochastic simulation[32]	6
WI4129	Stochastic differential equations (MM-4TU)	6
MM-STAR	Stochastic processes	8
WI4465	Advanced Topics in Probability	6
WI4470	Mathematical Statistical Physics	6
WI4220	Modelling and analysis of time-to-event data[33]	6
WI4435	Nonparametric Statistics[34]	6
MM-4TU	MasterMath Applied Statistics TUD version[35]	6
MM-4TU	MasterMath Applied Statistics TU/e version	6
MM-4TU	MasterMath Applied Statistics UT version	6

The following mathematics courses are recommended:

Code	*Course name*	*EC*
MM-NDNS+	Dynamical Systems[36]	8
MM-LNMB	Queuing Theory	6
MM-Diamant	Ergodic Theory	8
WI4201	Scientific computing	6
WI4203	Applied Functional Analysis	6
Leiden Univ.	Bayesian Statistics	6
MM-STAR	Assymptotic statistics	8

[31] Offered only in even years.
[32] Offered only in uneven years.
[33] Offered only in uneven years.
[34] Offered only in even years. May not be combined with MasterMath Applied Statistics TUD version.
[35] May not be combined with WI4435 Nonparametric Statistics.
[36] May not be combined with WI4042 Dynamical Systems.

MM-STAR	Measure-theoretic probability	8
MM-STAR	Machine learning theory	8
MM-Multi	Forensic probability and statistics	8
MM-STAR	Time series	8
MM-Diamant	Probabilistic and Extremal Combinatorics	8

The following non-mathematics courses are recommended:

Code	*Course name*	*EC*
IN4301	Performance Analysis	5

3. The non-mathematics elective space may be used for
   - non-mathematics courses required for the subject of the chosen thesis project,
   - homologation, i.e. courses at Bachelor's level required to obtain the necessary prior knowledge for a course at Master's level,
   - courses of the SEC specialisation, or
   - an internship of 12 (WI5012) or 18 (WI5118) credits;

   Additionally, a maximum of 3 credits may be spent on the following courses:

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1102TU	Written English for technologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2

   Please note:

   Language courses may only be chosen if required. Placement tests showing the necessity to take one or more of these courses must be taken and submitted to the master coordinator.
4. The thesis project is performed under supervision of (at least) one of the research groups at DIAM.

   There are two course codes:
   - WI5005 (general code) and
   - WI5005EXT (code for students whose IEP does not contain internship WI5012 or WI5118 and are therefore required to perform their thesis project outside DIAM).

Article 8B – The joint Master's Programme in Computer Simulations for Science and Engineering (COSSE)

1. Students in the joint Master's Programme in Computer Simulations for Science and Engineering (COSSE) follow the programme composed by the partners TU Delft, TU Berlin and KTH. This programme requires that students attend different universities in the first and the second year. However, both universities must be represented by full professors of the Mathematics departments of these universities in the committee in charge of the examination of the thesis.
2. An IEP of students in the programme at Delft University of Technology in their first year consists of:
   1. The core courses,
   2. At least 3 elective courses
3. The core courses consist of the following courses:

Code	*Name*	*EC*

TW3730TU	Numerical Methods for Differential Equations	6
WI4019	Non-linear Differential Equations	6
WI4201COSSE	Scientific Computing (COSSE)	8
WI4204	Advanced Modeling	6
WI4205	Applied Finite Elements (MM-4TU)	6

And two from the following list:

Code	*Name*	*EC*
WI4203	Applied Functional Analysis	6
WI4227-14	Discrete Optimisation	6
WI4430	Martingales, Brownian motion, and Stochastic Processes	6
WI4455	Statistical Inference	6

4. The preparatory courses may be chosen from the following list:

Code	*Name*	*EC*
WI4011-17	Computational Fluid Dynamics	6
WI4223COSSE	Advanced Modelling Methods	6
IN4049TU	Introduction to High Performance Computing	6
IN4307	Medical Visualization	5
WI4220	Modeling and analysis of time-to-event data	6
WI4450	Special Topics in Computational Science and Engineering	6

Other courses will be considered by the Board of Examiners if and when requested.

5. An IEP of students in the programme at Delft University of Technology in their second year consists of:
   a. Core courses 6 credits
   b. Specialisation courses worth at least 12 credits
   c. A Seminar/Literature Study worth 12 credits (WI5001COSSE)
   d. The thesis project worth 30 credits (WI5000COSSE)

5. Core courses: one from the following list

Code	Name	EC
WI4203	Applied Functional Analysis	6
WI4227-14	Discrete Optimisation	6
WI4430	Martingales, Brownian Motion and Stochatic Calculus	6
WI4455	Statistical Inference	6

The specialisation courses from the following list:

Code	*Course name*	*EC*
WI4011-17	Computational Fluid Dynamics	6
WI4475	Data Assimilation	6
WI4226	Advanced Systems Theory	6
WI4207	Continuous Optimization	6
WI4212	Advanced Numerical Methods	6
WI4450	Special Topics in Computational Science and Engineering	6
WI4231	Mathematical Data Science	6
WI4495	Perturbation Methods	6
WI4209	Systems and Control (MM-4TU, -DISC)	6

WI4420	Continuum Mechanics[37] (MM-4TU, NDNS+)	8
WI4221	Control of Discrete-Time Stochastic Systems	6

The following non-mathematics courses are recommended:

Code	*Course name*	*EC*
IN4049TU	Introduction to High Performance Computing	6
WI4260TU	Scientific Programming for Engineers	3
WI4265TU	Parallel Programming	3

Other courses will be considered by the Board of Examiners if and when requested.

7. A thesis project as described in article 3 worth 30 credits. Approval of the IEP by the responsible professor of the thesis and the Board of Examiners is required before the thesis work starts.
8. The Delft University of Technology Applied Mathematics Master's degree will be awarded if a student has earned a 'V' (passed) or a mark that is greater than or equal to 6, for all study units of his or her IEP of the COSSE Master's programme at Delft University of Technology in the first year and has passed all study units of the second year of the COSSE Master's programme at one of the other COSSE universities;
   or
   if a student has passed all study units of the first year of the COSSE Master's programme at one of the other COSSE universities and has earned a 'V' (passed) or a mark that is greater than or equal to 6 for all study units of his or her IEP at Delft University of Technology in the second year of his or her COSSE Master's programme. This implies that the IEP should satisfy the requirements of the Delft University of Technology Applied Mathematics Master's degree.

Article 9 – Bridging programmes for professional education graduates

There are no bridging programmes.

[37] Offered only in uneven years.

Part 2B Computer Engineering

Article 10 – General

The composition of the exam programme is as follows:

1. The programme core of 11 credits,
2. A track core of four courses,
3. Specialisation courses worth an amount of credits required to obtain the minimum of the sum of 49 credits in combination with the track core,
4. If required, homologation courses, of which a maximum of 10 credits may be included in the IEP,
5. A thesis project worth 45 credits,
6. If the total number of credits under 1 to 4 is lower than 120 credits the IEP should be completed with free electives to a minimum of 120 credits.

Article 11 – Programme details

1. The compulsory core courses are:

Code	*Name*	*EC*
EE4C01	Profile Orientation and Academic Skills	3
EE4C02	System Engineering	3

At least one further core course is chosen from the following list:

Code	*Name*	*EC*
EE4C03	Statistical Digital Signal Processing and Modeling	5
EE4C04	Control Theory	5
EE4C05	Electromagnetics	5
EE4C06	Networking	5
EE4C07	Advanced Computing Systems	5
EE4C08	Measurement and Instrumentation	5
EE4C10	Electronic Design	5

2. Four track core courses are chosen from the following list:

Code	*Name*	*EC*
ET4074	Modern Computer Architectures	5
CS4200-A	Compiler Construction	5
ET4054	Methods and Algorithms for System Design	5
ET4170	Computer Arithmetic	5
ET4171	Processor Design Project	5
IN4049TU	Introduction to high performance computing	6

3. A list of suggested specialisation courses and specialisation profiles can be obtained from the master coordinator. The list may contain non-CE courses but will then restrict the number of them that can be chosen in the specialization space. For courses that are not on this list, a motivated request to follow that course can be submitted to the board of examiners for approval. Additional core and track core courses can always be taken as specialization course.
4. If a student does not have all the prior knowledge and skills required for the Master's degree in Electrical Engineering, he or she may include in the free elective space courses worth at most 10 credits at Bachelor's level to obtain these. For subjects that are not explicitly indicated as homologation for the track approval by the Board of Examiners is required.
5. A thesis project (ET4300) worth 45 credits.
6. The free elective space may be used for courses, an internship or an extra project.
   If desired, the internship or the extra project can be used as a preparation for the thesis project. If so, there should be a clear separation between activities within the internship or extra project and within the thesis project. The assessment will take place by means of a report at the end of the

internship or extra project, such that the thesis project can be clearly evaluated in isolation. Students from Dutch HBO programmes who have had 30 credits or more worth of work experience in their prior education, may not include the internship in their IEP.

Code	*Name*	*EC*
ET4399	Extra project	3-15
EE5010	Internship	10-15
EWI4020	Joint Interdisciplinary Project	15

Up to 6 credits may be spent on language courses. These may only be chosen if required. Placement tests showing the necessity to take one or more of these courses must be taken and submitted to the master coordinator.

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1136TU	Written English for technologists-1[38]	3
WM1102TU	Written English for technologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM1117TU	Dutch intermediate 1	3

Article 12 – Bridging programmes for professional education graduates

1. Students having obtained a relevant 'HBO degree' from a Dutch institute of professional education in Electrical Engineering (Elektrotechniek) or Embedded Systems can gain access to the Master's degree programme via a bridging programme.
2. The bridging programme consists of the following courses:

Code	*Name*	*EC*
WI1708TH1	Analysis 1	3
WI1708TH2	Analysis 2	3
WI1807TH1	Linear Algebra	3
WI1909TH	Differential Equations	3
EE2S11	Signals and Systems	5
EE3D11	Computer Architecture and Organisation	5
CSE2430	Operating Systems	5
CSE1305	Algorithms and Data Structures	5
EE8002	Literature Study for Electrical Enginering	2
EE1M31	Probability and Statistics	5
EE2S31	Signal Processing	5

3. Students will gain access to the Master's degree programme in Computer Engineering when they have obtained their HBO degree, fulfilled the language requirements of the master programme

[38] WM1136TU and WM1102 may not be selected both. WM1136TU is a bachelor course, this course can be selected as a homologation course.

and earned a 'V' (passed) or a mark greater than or equal to 6 for all the courses in their bridging programme.

Part 2C Computer Science

Article 13 – General

1. The Master's degree programme in Computer Science has two tracks, *Data Science & Technology* and *Software Technology*, described in detail in article 14A and 14B and EIT Digital Master School with specialisations *Digital Media Technology*[39] and *Cloud Computing and Services*, described in article 14C. TU Delft's involvement in this EIT programme will be discontinued as of academic year 2019/2020.
2. Students may opt for one of the special programmes in Bioinformatics, Cyber Security or Information Architecture (ref. article 14B), which will be mentioned on the student's diploma supplement under *Specialisation*.

Article 14 – Programme details

Article 14A – The tracks Data Science & Technology (DST) and Software Technology (ST) *without* special programme

1. An IEP in these tracks has a minimum study load of 120 credits and consists of
   a) a common core,
   b) Computer Science specialisation courses,
   c) a course that provides students with knowledge of the research methods within the field of Computer Science or a Literature survey (IN4306),
   d) free electives: courses at academic Master's level that may be chosen freely,
   e) a thesis project (IN5000 Final project) worth 45 credits and if required, homologation.
2. The thesis project is carried out under supervision of one of the following EEMCS research groups:
   - Algorithmics (ALG),
   - Computer Graphics and Visualisation (CGV),
   - Cyber Security (CybSec),
   - Distributed Systems (DS)
   - Embedded and Networked Systems (ENSys),
   - Interactive Intelligence (II),
   - Multimedia Computing (MC),
   - Pattern Recognition & Bioinformatics (PRB),
   - Programming Languages (PL)
   - Software Engineering (SE)
   - Web Information Systems (WIS)
3. The IEP must be drawn up in agreement with the IEP reviewer of the research group in which the student wishes to carry out his or her thesis project. The IEP reviewer is a member of the scientific staff of that research group.
4. The IEP should be composed as follows:
   a. Students of the Data Science & Technology track choose 4 out of 9 common core courses from the related following lists:

Data Science & Technology common core courses:

Code	*Name*	*EC*
CS4065	Multimedia Search and Recommendation	5
CS4035	Cyber data analytics	5

[39] Please note that in 2018-2019 the name 'Visual Computing and Communication (VCC)' is also used as a synonym for Digital Media Technology (DMT).

IN4010(-12)	Artificial Intelligence Techniques	6
IN4086-14	Data Visualization	6
IN4252	Web Science & Engineering	5
IN4301	Advanced Algorithms	5
IN4315	Software Architecture	5
IN4391	Distributed Computing Systems	5
CS4220	Machine Learning 1	5

b. Students of the Software Technology track choose 5 out of 11 common core courses from the related following lists:

Software Technology common core courses:

Code	*Name*	*EC*
IN4152	3D Computer Graphics and Animation	5
CS4065	Multimedia Search and Recommendation	5
CS4015	Behaviour Change Support Systems	5
IN4150	Distributed Algorithms	6
IN4191	Security and cryptography	5
IN4252	Web Science & Engineering	5
IN4301	Advanced Algorithms	5
CS4200-A	Compiler Construction	5
IN4343	Real-time Systems	5
IN4315	Software Architecture	5
CS4220	Machine Learning 1	5

c. at least 15 credits worth of courses chosen from the list of Computer Science specialisation courses published in the digital study guide were chosen.

d. the seminar of the research group in which the thesis is performed or a Literature Study (IN4306) is part of said IEP. The Literature Study as well as the courses in this list below provide students with knowledge of the research methods within the field of Computer Science.

Code	*Name*	*EC*
IN4326	Seminar Web Information Systems	5
IN4398	Seminar Internet of Things	5
CS4165	Seminar Social Signal Processing	5
IN4314	Seminar Selected Topics in Multimedia Computing	5
CS4130	Seminar Programming Languages	5
IN4310	Seminar Computer Graphics	5
IN4334	Analytics and Machine Learning for Software Engineering	5
CS4125	Seminar Research Methodology for Data Science	5
CS4245	Seminar Computer Vision by Deep Learning	5
CS4120	Seminar Cyber Security	5
IN4392	Cloud Computing	5
CS4210-B	Intelligent Decision Making Project	5

e. the number of credits spent on free electives in said IEP is no higher than 25 credits. See the digital Study Guide for course options. A language course may be part of the IEP. See the list and requirements below.

Free electives: language course list

Up to 3 credits may be spent on language courses. These may only be chosen if required. Placement tests showing the necessity to take one or more of these courses must be taken and submitted to the master coordinator.

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1136TU	Written English for technologists-1[40]	3
WM1102TU	Written English fortechnologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM11117TU	Dutch intermediate 1	3

The free elective space may also be used for an extra project

Code	*Name*	*EC*
CS4399	Extra Project (max. 15EC)	15
EWI4020	Joint Interdisciplinary Project (JIP)	15

f. the number of credits spent on homologation in said IEP is no higher than 15 credits,

g. at least 40 credits of the courses in the IEP (notwithstanding the thesis project) should be Computer Science courses. A list of these courses is published annually in the digital study guide.

h. Entrepreneurship and Innovation Education list

Code	*Name*	*EC*
MOT9610	Entrepreneurship basic course	5
MOT9611	Project entrepreneurship thesis related	5
MOT9612	Business development lab	5

i. Quantum Computing list

Code	*Name*	*EC*
AP3421	Fundamentals of quantum information	4
CS4090	Quantum communication and cryptography	5
AP3292	Quantum hardware	6
EE4575	Electronics for Quantum Computation	5

[40] WM1136TU and WM1102 may not be selected both. WM1136TU is a bachelor course, this course can be selected as a homologation course.

Article 14B – The tracks Data Science & Technology (DST) and Software Technology (ST) *with* special programme

1. Students may opt for a Special programme in Bioinformatics, Cyber Security or Information Architecture.
2. An IEP in these tracks has a minimum study load of 120 credits and consists of
   a) The courses required by the special programmes (see below)
   b) a thesis project (IN5000 Final project) worth 45 credits and

The special programme in Bioinformatics

General Setup

1	DST Common Core courses (choose 4 out of 9)	>20EC
2	BI core courses	25EC
3	BI specialization courses	>15EC
4	Literature study	10EC
5	Free electives	>10EC
6	Thesis project	45EC

IEP must be approved by the Bioinformatics Coordinator

1. Students in the special programme in Bioinformatics follow the Data Science & Technology. (ref. article 14A, subsection 4a, 4b).
2. Compulsory Bioinformatics courses (25 EC)

Code	*Name*	*EC*
CS4250	Selected topics in molecular biology	5
CS4255	Algorithms for sequence-based bioinformatics	5
CS4176*	Algorithms for network-based bioinformatics	5
CS4260	Machine learning in bioinformatics	5
CS4329**	Recent topics in bioinformatics	5

**CS4176 --> Old name: IN4176 Functional Genomics & Systems Biology, 6EC*

***CS4329 --> Old name: IN4329 Advanced Bioinformatics, 4EC*

3. Specialization courses: choose at least 15 EC:

Code	*Name*	*EC*
Bioinformatics specialization Courses Q1		
CS4070	Multivariate Data Analysis	5
EE4C06	Networking	5
IN4049TU	Introduction to High Performance Computing	6
CS4220	Machine Learning 1 *	5
IN4252	Web Science & Engineering	5
IN4301	Advanced Algorithms	5
IN4010(-12)	Artificial Intelligence Techniques	6
IN4307	Medical Visualization	5
IN4309	Random Signal Processing	5

**) Old course code: IN4085 Pattern Recognition*

Bioinformatics specialization Courses Q2		
IN4086-14	Data Visualization	6
IN4150	Distributed Algorithms	6
NB4130TU	Biologic	3

Bioinformatics specialization Courses Q3

CSxyz05	Deep Learning **	5
CS4195	Modeling and Data Analysis in Complex Networks	5
CS4230	Machine Learning 2 ***	5
IN4391	Distributed Systems	5
IN4325	Information Retrieval	5
IN4315	Software Architecture	5

***) Old course code: CS4180 Deep Learning*

****)Old course code IN4320 Machine Learning*

Bioinformatics specialization Courses Q4

CS4205	Evolutionary Algorithms	5
IN4331	Web-scale Data Management	5
IN4392	Cloud Computing	5
CS4245	Seminar Computer Vision by Deep Learning ****	5

*****) Old course code: IN4393-16 Computer Vision*

4. Literature Study (10 EC)

Code	*Name*	*EC*
IN4306	Literature Study	10

5. Free Electives (> 10EC).
6. Thesis Project (45 EC)The thesis is performed under supervision of the Pattern Recognition & Bioinformatics research group.

Code	*Name*	*EC*
IN5000	Master Thesis Project	45

The special programme in Cyber Security

1. Student in the special programme in Cyber Security may choose between the Data Science & Technology and the Software Technology track.

2. Common Core Courses Cyber Security:

Code	*Name*	*EC*
ET4397IN	Network Security[41]	5
IN4191	Security and Cryptography	5
SPM5442	Cyber risk management	5
CS4035	Cyber data analytics	5
CS4150	Systems Security	5

3. Technical electives: choose at least 5 courses

Code	*Name*	*EC*
CS4155	Advanced Network Security	10
IN4253ET	"Hacking Lab"-Applied Security Analysis	5
UT201500040	Introduction to Biometrics	5

[41] If you take CS4155 then this replaces the requirement for ET4397IN.

UT201500042	Privacy Enhancing technologies	5
AP3421	Fundamentals of quantum information	4
CS4090	Quantum communication and cryptography	5
CS4160	Blockchain Engineering	5
UT192110940	Secure data management	5
CS4110	Software Testing and Reverse Engineering	5
UT201500039	Security verification	5
CS4106	Dynamic and Static Programme Analysis for Software Security	5

4. Socio-Technical Electives: choose at least 3 courses

Code	*Name*	*EC*
UT201100022	Cyber Crime Science	5
UT201500038	E-Law	5
WM0824TU	Economics of Security	5
UT201500041	Cyber Security Management	5
UT191612680	Computer Ethics	5
CS4185	Capstone Cyber Security	5

5. Required courses for CS graduation:

Code	*Name*	*EC*
CS4120	Seminar Cyber Security	5
	Master Thesis Project in Cyber Security	45

6. The Master Thesis project (45 credits) is performed under supervision of the Cyber Security research group.

7. Free Electives: the remaining credits to make up the programme are chosen in consultation with the programme coordinator.

The special programme in Information Architecture

1. Students in the special programme in Information Architecture may choose between the Data Science & Technology and the Software Technology track.
2. Students take the compulsory Information Architecture courses and fulfil the requirements of the chosen track (ref. article 14A, subsection 4a and 4b).
3. Compulsory Information Architecture courses:

Code	*Name*	*EC*
IN4252	Web Science & Engineering	5
IN4325	Information Retrieval	5
IN4331	Web-scale Data Management	5
SEN1141	Managing Multi Actor Decision Making	5
SEN1611	I&C Architecture Design	5
SEN1621	I&C Service Design	5
SEN1121	Complex Systems engineering	5

And in addition to said compulsory Information Architecture courses :

- Students of the Data Science & Technology track need to take 3 additional common core courses.
- Students of the Software Technology track need to take 4 additional common core courses.

4. The thesis is performed under supervision of the Web Information Systems research group.

Article 14C – Details of the EIT programmes

1. Students in the EIT Master's Programme in ICT Innovation follow a two-year Master's programme offered by a consortium of universities organized in EIT Digital Master School. This programme requires that students are enrolled at different universities in the first (entry point) and the second (exit point) year. The programme is described on the website of the EIT Digital Master school: http://www.masterschool.eitictlabs.eu/programmes/.
2. The Delft University of Technology Computer Science Master's degree will be awarded if a student has earned for all study units of his or her IEP of the EIT Master's programme at Delft University of Technology in the first year a 'V' (passed) or a mark that is greater than or equal to 6, has passed all study units of the second year of the EIT Master's programme at one of the other EIT Digital universities;

   or if a student has passed all study units of the first year of the EIT Master's programme at one of the other EIT Digital universities and has earned for all study units of his or her IEP at Delft University of Technology in the second year of his or her EIT Master's programme a 'V' (passed) or a mark that is greater than or equal to 6.

   Both degrees will be certified with an EIT label. To receive two officially recognised Master of Science Degrees both universities (first and second year) must be represented by full professors of the ICT departments of these universities in the committee in charge of the examination of the thesis.
3. TU Delft's involvement in this EIT programme will be discontinued as of academic year 2019/2020. As result of this, there will be no new intake starting September 2019. Students who started in September 2018 will be able to finish their programme in 2019-2020.

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I – Specialisation Digital Media Technology (DMT)[42]

1. For the Specialisation Digital Media Technology (DMT) students spending their first year at Delft University of Technology, the programme is structured as follows:

Year 1 - Compulsory DMT courses:

Code	*Name*	*EC*
IN4086-14	Data Visualization	6
IN4309	Random Signal Processing	5
IN4252	Web Science & Engineering	5
EE4C06	Networking	5

Year 1 - Compulsory I&E courses:

Code	*Name*	*EC*
MOT9610	Entrepreneurship basic	5
IN4401	Business Development Lab	10
IN4394	I&E Summer School	4

Year 1 - Elective courses:

Code	*Name*	*EC*
IN4326	Seminar Web Information Systems	5
IN4152	3D Computer Graphics and Animation	5
IN4182	Digital Audio and Speech Processing	6
IN4325	Information Retrieval	5
IN4314	Seminar Selected Topics in Multimedia Computing	5
IN4331	Web-scale Data Management	5

[42] Please note that in 2018-2019 the name 'Visual Computing and Communication (VCC)' is also used as a synonym for Digital Media Technology (DMT).

CS4245	Seminar Computer Vision by Deep Learning	5

Year 1 - Elective I&E courses (minimal 5 credits):

Code	*Name*	*EC*
MOT1461	Financial Management	5
MOT1532	High-Tech Marketing	5
MOT9556	Corporate entrepreneurship	6
MOT1434	Technology, Strategy and entrepreneurship	5
MOT2421	Emerging and Breakthrough Technologies	6

2. For students spending their second year at Delft University of Technology (Medical Visualisation), the programme is structured as follows:

Year 2 - Compulsory DMT courses:

Code	*Name*	*EC*
IN4307	Medical Visualization	5
TPM006A	I&E Study	6
IN5030	ICT Innovation thesis project	30

Year 2 - Choose 2 from:

IN4310	Seminar Computer Graphics	5
CS4220	Machine Learning 1	5
IN4314	Seminar Selected Topics in Multimedia Computing	5

Year 2 - Elective DMT courses (at least 13 credits)

See elective courses first year and also the Study Guide for courses.

II – Specialisation Cloud Computing and Services (CCS)

For the Specialisation Cloud Computing and Services (CCS) students spending their first year at Delft University of Technology, the programme is structured as follows:

Year 1 CCS Compulsory courses (21 credits):

Code	*Name*	*EC*
IN4150	Distributed Algorithms	6
IN4392	Seminar Cloud Computing	5
IN4254	Smart Phone Sensing	5
IN4252	Web Science & Engineering	5

Compulsory I&E courses (at least 24 credits):

Code	*Name*	*EC*
Compulsory:		
IN4401	Business development lab	10
IN4394	I&E Summer school	4
MOT9610	Entrepreneurship basic course	5
Select 1 from:		
WM0506	Ready to startup	6
MOT1461	Financial Management	5
MOT1532	High-Tech Marketing	5
MOT9556	Corporate entrepreneurship	6
MOT1435	Technology, Strategy and entrepreneurship	5

MOT2421	Emerging and Breakthrough Technologies	6

Electives Year 1 (at least 15 credits) and 2 (at least 9)

Code	*Name*	*EC*
IN4391	Distributed Computing Systems	5
IN4315	Software Architecture	5
IN4185	Globally Distributed Software Engineering	5
IN4334	Analytics and Machine Learning for Software Engineering	5
IN4331	Web-scale Data Management	5
IN4398	Seminar Internet of Things	5
CS4055	High Performance Data Networking	5
IN4086-14	Data Visualization	6
IN4325	Information Retrieval	5

2. For CCS students spending their second year at Delft University of Technology, the programme is structured as follows:

Compulsory courses:

Code	*Name*	*EC*
CS4160	Blockchain engineering	5
IN4398	Seminar Internet Of Things	5
IN4326	Seminar Web Information Systems	5
TPM006A	I&E Study	6
IN5030	ICT Innovation thesis project	30

Article 15 – Bridging programmes

Article 15A – For professional education graduates

1. Students having obtained a relevant bachelor's degree in Computer Science & Engineering from a Dutch institute of professional education (HBO) can gain access to the Master's degree programme via a bridging programme.
2. The bridging programme for Computer Science consists of the following courses:

Code	*Name*	*EC*
WI1708TH1	*Analysis 1*	*3*
WI1708TH2	*Analysis 2*	*3*
WI1807TH1	*Linear Algebra 1*	*3*
WI1807TH2	*Linear Algebra 2*	*3*
CSE1300	*Reasoning and Logic*	*5*
CSE1110	*Software Quality and Testing*	*5*
CSE2310	*Algorithm Design*	*5*
CSE1505	*Information and Data Management*	*5*
CSE1210	*Probability Theory and Statistics*	*5*
CSE2315	*Automata, Languages and Computability*	*5*
TI3706	*Bachelor's Seminar*	*5*

3. Students will gain access to the Master's degree programme in Computer Science when they have obtained their HBO degree, fulfilled the language requirements of the master programme and earned a 'V' (passed) or a mark greater than or equal to 6 for all the courses in their bridging programme.

Article 15B – For research university graduates

1. Students having obtained a bachelor's degree from the following bachelor programmes of the TU Delft, TU Eindhoven or TU Twente can gain access to the Master's degree programme via a bridging programme:
    a. Electrical Engineering
    b. Applied Mathematics
2. The bridging programme for Computer Science consists of the courses listed below.

The following courses are compulsory:

Code	*Name*	*EC*
CSE1100	Object-oriented programming	5
CSE1300	Reasoning and Logic	5
CSE1110	Software Quality and Testing	5
CSE2310	Algorithm Design	5
CSE1500	Web and Database Technology	5
CSE1505	Information and Data Management	5
CSE2315	Automata, Languages and Computability	5

Students choose one of the following courses:

CSE2115	Software Engineering Methods	5
CSE2120	Concepts of Programming Languages	5
CSE2530	Computational Intelligence	5
CSE2525	Data Mining	5

3. If the student's prior education overlaps with courses of the bridging programme these courses may be removed from the student's bridging programme.
4. Students will gain access to the Master's degree programme in Computer Science when they have obtained their university degree and earned a 'V' (passed) or a mark greater than or equal to 6 for all the courses in their bridging programme.

Part 2D Electrical Engineering

Article 16 – General

1. The Master's degree programme in Electrical Engineering has four tracks:
   a. Wireless Communication and Sensing (WiCoS)[43]
   b. Micro Electronics (ME)
   c. Electrical Power Engineering (EPE)
   d. Signals and Systems (S&S)
2. An IEP consists of the following parts, which are described in article 16A.
   1. The programme main core of 21 credits,
   2. A track core of three courses,
   3. Specialisation courses worth an amount of credits required to obtain the minimum of the sum of 60 credits in combination with the main core and the track core,
   4. A thesis project worth 45 credits,
   5. If the total number of credits under 1 to 4 is lower than 120 credits the IEP should be completed with free electives to a minimum of 120 credits. Free electives should be master level courses, except that a maximum of 10 credits in the free electives can be BSc-level homologation courses.
2. The composition of the Erasmus Mundus Programme European Wind Energy Master (EWEM) elective profile in Electric Power Systems deviates and is described in article 17B.

Article 17 – Programme details

Article 17A – Composition of the track programmes

1. The programme main core consists of the following compulsory courses:

Code	*Name*	*EC*
EE4C01	Profile Orientation and Academic Skills	3
EE4C02	Systems Engineering	3

and three courses chosen from the following list:

Code	*Name*	*EC*
EE4C03	Statistical Digital Signal Processing and Modeling	5
EE4C04	Control Theory	5
EE4C05	Electromagnetics	5
EE4C06	Networking	5
EE4C07	Advanced Computing Systems	5
EE4C08	Measurement and Instrumentation	5
EE4C10	Electronic Design	5

2. The track core is specified by the relating track:
   For *Wireless Communication and Sensing* select three courses from the following list:

Code	*Name*	*EC*
CS4055	High Performance Data Networking	5
IN4341	Performance Analysis	5
EE4510	Advanced Electromagnetics	5
EE4560	Information Theory	5

[43] The track Wireless communication and sensing replaces the track Telecommunications and Sensing Systems (TSS). For more details, see the Transitional Regulations, article 25B.

EE4565	Propagation and Scattering of EM Waves	5
EE4600	RF / Wireless Concepts and Systems	5
EE4016	Antenna Systems	5
ET4169	Microwaves, Radar & Remote Sensing	5
ET4358	Wireless Communications	5
ET4386	Estimation and Detection	5

For *Microelectronics* select three courses from the following list:

Code	*Name*	*EC*
EE4520	Analog CMOS design I	3
EE4585	Semiconductor Device Physics	5
EE4605	Integrated Circuits for RF/Wireless Applications	5
ET4257	Sensors and Actuators	4
ET4289	Integrated Circuits and MEMS Technology	4
EE4610	Digital IC design I	3
EE4600	RF / Wireless Concepts and Systems	5

For *Electrical Power Engineering* select three courses from the following list:

Code	*Name*	*EC*
EE4585	Semiconductor Device Physics	5
ET4103	High Voltage Technology	4
ET4108	Transients in Power Systems	4
ET4117	Electrical Machines and Drives	4
ET4119	Electronic Power Conversion	4
ET4376	Photovoltaic Basics	4

For *Signals & Systems* select three courses from the following list:

Code	*Name*	*EC*
EE4530	Applied Convex Optimization	5
EE4560	Information Theory	5
EE4595	Wavefield Imaging	5
ET4169	Microwaves, Radar & Remote Sensing	5
ET4358	Wireless Communications	5
ET4386	Estimation and Detection	5

3. A list of suggested specialisation courses and specialisation profiles can be obtained from the master coordinator of the track. The list may contain non-EE courses but will then restrict the number of them that can be chosen in the specialization space.
   For courses that are not on this list, a motivated request to follow that course can be submitted to the board of examiners for approval. Additional main core and track core courses can always be taken as specialization course.
4. If a student does not have all the prior knowledge and skills required for the Master's degree in Electrical Engineering, he or she may include in the free elective space courses worth at most 10 credits at Bachelor's level to obtain these. For subjects that are not explicitly indicated as homologation for the track approval by the Board of Examiners is required.
5. A thesis project (ET4300) worth 45 credits[44].

[44] For exceptions for older cohorts: see Part 3 Transitional regulations.

6. The free elective space may be used for courses, an internship or an extra project.

   If desired, the internship or the extra project can be used as a preparation for the thesis project. If so, there should be a clear separation between activities within the internship or extra project and within the thesis project. The assessment will take place by means of a report at the end of the internship or extra project, such that the thesis project can be clearly evaluated in isolation.

   Students from Dutch HBO programmes who have had 30 credits or more worth of work experience in their prior education, may not include the internship in their IEP[45].

Code	*Name*	*EC*
ET4399	Extra project	3-15
EE5010	Internship	10-15
EWI4020	Joint Interdisciplinary Project	15

Up to 6 credits may be spent on language courses. These may only be chosen if required. Placement tests showing the necessity to take one or more of these courses must be taken and submitted to the master coordinator.

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1136TU[46]	Written English for technologists-1	3
WM1102TU	Written English for technologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM1117TU	Dutch intermediate 1	3

Article 17B – Erasmus Mundus Programme European Wind Energy Master (EWEM) in Electric Power Systems

1. Students in the Erasmus Mundus Master's Programme in European Wind Energy Master (EWEM) follow the programme required by Erasmus Mundus. This programme requires that students attend three of the four partner-universities during the two years MSc programme. At least two universities must be represented by professors of the involved departments of these universities in the committee in charge of the examination of the thesis.
2. An individual study programme of students in the EWEM elective profile Electric Power Systems consists of:
   a. Core courses worth 31.5 credits
   b. Elective courses worth at least 43.5 credits
   c. The thesis project worth 45 credits
3. The courses are followed at the University of Technology Denmark (DTU) in the first semester, at Delft University of Technology (TUD) the second semester and at Norwegian University of Science and Technology (NTNU)in the third semester of the programme (first semester of the second year).
4. The complete programme is described in http://ewem.tudelft.nl/
5. A minimum of 47 credits should belong to courses from an Electrical Engineering programme.

[45] See part 3, Transitional regulations for an exception for older cohorts.

[46] WM1136TU and WM1102 may not be selected both. WM1136TU is a bachelor course, this course can be selected as a homologation course.

6. Language and Communication skills (limited to between 3 and 5 credits) and an internship (limited to 6 credits) can be chosen as part of the elective space in any of the semesters at any of the participating partner universities.
7. In addition to the recommended electives, students can choose other courses from the total available list of the EWEM partner universities, in agreement with the local academic track coordinators.
8. The TU Delft Electrical Engineering degree will be awarded if a student has earned for all study units of his or her individual study programme of the EWEM programme at TU Delft a mark that is greater than or equal to 6, and has passed all study units of the EWEM programme at DTU and NTNU.
9. The thesis project is the final study unit of the programme and serves to prove that the student acquired the academic competences of a Master of Science. The student executes the thesis project independently, with guidance of at least two supervisors, one of them from the scientific staff of TU Delft, and one from the scientific staff of NTNU.

Article 18 – Bridging programmes for professional education graduates

1. Students with a bachelor's degree (HBO diploma) from a Dutch institute of professional education in Electrical Engineering can gain access to the Master's degree programmes in Electrical Engineering (via a bridging programme.
2. Depending on the track chosen and the prior education of a student, the respective admissions committees can require additional compulsory homologation courses to be followed as part of the Master's programme.
3. The bridging program is comprised of the following study units, where the track-specific courses are compulsory for the students that will enrol in the given track:

	Code	*Name*	*EC*
	WI1708TH1	Analyse deel 1	3
	WI1708TH2	Analyse deel 2	3
	WI1708TH3	Analyse deel 3	3
	WI1808TH1	Lineaire Algebra	3
	WI1809TH	Differentiaalvergelijkingen	3
	EE2S11	Signals and Systems	5
	EE1P21	Electricity and Magnetism	5
	EE2S31	Signal Processing	5
	EE2S21	Systems and Control	5
	EE8002	Literature Study for Electrical Engineering	2
Track specific courses			
WiCoS	EE2T11-BP	Telecommunications A Bridging Programme	3
	EE2T21	Telecommunications B	5
ME	EE3C11	Electronics	5
ESE	EE2E11	Electrical Energy Conversion	5
S&S		No other course required	

Students will gain access to the Master's degree programme in Electrical Engineering when they have obtained their HBO degree, fulfilled the language requirements of the master programme and earned a 'V' (passed) or a mark greater than or equal to 6 for all the courses in their bridging programme.

Part 2E Embedded Systems

Article 19A – General

The composition of the exam programme is as follows:

1. Core courses worth 25 credits,
2. A specialisation with courses worth at least 55 credits,
3. A thesis project worth 40 credits, comprising
   a. the preparation for the thesis project worth 10 credits (IN4610 Research Project), and
   b. the thesis project itself, worth 30 credits (IN4600 Final Project Project).
4. If required, deficiency courses, of which a maximum of 10 credits may be included in the IEP. If fewer or no deficiency course is required the students must spent the remaining credits on specialisation courses.

Article 19B – 4TU character of the Master's degree programme in Embedded Systems

1. The Master's degree programme in Embedded Systems is a 4TU programme. The programme is offered at TUE (Eindhoven University of Technology), TUD (Delft University of Technology) and UT (University of Twente). The programmes have identical learning objectives and programme structure. The mandatory common core courses are the same and have common learning outcomes, though they might somewhat differ with respect to contents.
2. After a student has been formally enrolled in the Master's programme in Embedded Systems at one of the 3 universities at the beginning of the first year, he or she will also obtain a secondary enrolment (neveninschrijving) at the 2 other universities. To retain a secondary enrolment after the first year as well, the student has to select this option when extending his/her study in Studylink.
3. Students are allowed to choose elective subjects from the lists of electives from each of the 3 programmes, after approval by the Board of Examiners of the home university.

Article 20 – Programme details

1. The 5 core courses are:

Code	*Name*	*EC*
ET4074	Modern Computer Architectures	5
CS4140ES	Embedded Systems Laboratory	5
IN4343	Real-time Systems	5
IN4387	System Validation	5
IN4390*	Quantitative Evaluation of Embedded Systems	5

*Students who started in academic year 2018-2019 are not required to include this course in their IEP (they have to do an extra specialisation course instead). Students from older cohorts and students from 2019-2020 onwards do have to include this course in their IEP.

2. The specialisation consists of
   1. courses worth at least 20 credits from one of the specialisation list,
   2. Additional courses worth at least 30 credits, which may be chosen from the ES specialisation lists, the project and internship list and the language course list (max. 6 credits) or from other Master's programmes.

   Students must select all specialisation courses in consultation with their prospective thesis advisor. All courses should relate to Embedded Systems or to the thesis subject. IEPs containing courses that are not part of one of the mentioned lists require approval from the board of examiners.

   The three specialisation lists:

   Computer Architecture with the following courses:

Code	*Name*	*EC*
EE4C07	Advanced Computing Systems	5
ET4054	Methods and Algorithms for System Design	5

ET4076-11	VLSI Test Technology & Reliability	5
ET4170	Computer Arithmetic	5
ET4171	Processor Design Project	5
EE4610	Digital IC design I	3
EE4615	Digital IC design II	3
ET4351	VLSI Systems on Chip	4
IN4350	Embedded Computer Architectures 2	5
EE4575	Electronics for quantum computing	5
EE4660	Hardware Attacks and Design for Security	5

Control Systems with the following courses:

Code	*Name*	*EC*
SC42025	Filtering & identification	6
SC42050	Knowledge Based Control Systems	4
SC42055	Optimization in Systems and Control	4
SC42060	Modelling and Nonlinear Systems Theory	4
SC42075	Modeling and Control of Hybrid Systems	3
SC42095	Digital Control	3
SC42010	Robust and Multivariable Control Design	5
SC42045	Control Systems Lab	4
SC42110	Dynamic Programming & Stochastic Control	5
SC42100	Networked & Distributed Control Systems	3
SC42130	Fault Diagnosis and Fault Tolerant Control	4
SC42125	Model Predictive Control	4
EE4C04*	Control System Design	5
SC42015*	Control Theory	6
SC42000*	Control System Design	3

*) Regarding the courses EE4C04, SC42015 and SC42000: due to contents overlap only 1 out of 3 courses can be selected.

Software & Networking with the following courses:

Code	*Name*	*EC*
EE4C06	Networking	5
ET4285	Measuring and simulating the Internet	4
ET4394	Wireless Networking	5
ET4397IN	Network security[47]	5
IN4150	Distributed Algorithms	6
IN4301	Advanced Algorithms	5
CS4200-A	Compiler Construction	5
CS4200-B	Compiler Construction Project	5
IN4315	Software Architecture	5
IN4351	Real-Time Software Development	5
IN4398	Seminar Internet of Things	5

CS4155	Advanced Network Security[48]	10
CS4055	High-performance Data Networking	5
IN4254	Smart Phone Sensing	5
ET4388	Ad-hoc Networks	5
ET4358	Wireless Communications	5
CS4210-A	Algorithms for Intelligent Decision Making	5
CS4210-B	Intelligent Decision Making Project	5
CS4205	Evolutionary Algorithms	5
IN4010(-12)	Artificial Intelligence Techniques	6
IN4191	Security and Cryptography	5

The project and internship list is:

Code	*Name*	*EC*
ET4380	Multi-disciplinary design project	10
ET4399	Extra project	10-15
EE5010	Internship	10-15
EWI4020	Joint Interdisciplinary Project	15

Please note:

Students may choose only one item from the project and internship list. Students with a Bachelor degree from a Dutch HBO institution who have had 30 credits or more worth of work experience in their prior education, may not include the internship in their IEP. Students who wish to carry out their Thesis project outside TU Delft (i.e. in a company or other organisation) in any case may not include the internship in their IEP.

The language course list:

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1136TU	Written English for technologists-1[49]	3
WM1139TU	Thesis Writing in English for the MSc	4
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM1117TU	Dutch intermediate 1	3

Please note:

Placement tests showing the necessity to take one or more of these courses must be taken and submitted to the master coordinator.

Entrepreneurship and Innovation Education list:

[48] May not be combined with ET4397IN Network Security (5 EC)

[49] WM1136TU and WM1102 may not be selected both. WM1136TU is a bachelor course, this course can be selected as a homologation course.

Code	*Name*	*EC*
MOT9610	Entrepreneurship basic course	5
MOT9611	Project entrepreneurship thesis related	5
MOT9612	Business development lab	5

Business Engineering & Management list:

Code	*Name*	*EC*
SEN9311	Digital Business	5
WM0516TU	Turning Technology into Business	6

3. Due to the interdisciplinary character of the Embedded Systems programme, most students will not have all necessary prior knowledge. To gain this knowledge they may complete deficiency courses in one more of the following subjects, which all represent approx. 2,5 credits worth of study load:

   Control Systems, Computer Architecture and Organisation, Algorithms and Data Structures, Programming skills, Software Engineering, Signal Processing, Digital Systems, Logic, Embedded Software, Operating Systems, Circuit Analysis. Other subjects are also possible.

   The subjects to be completed are chosen in collaboration with and decided on by the master coordinator. The following deficiency courses are on offer:

Code	*Name*	*EC*
CS4001DC	Logic and Set Theory	2.5
CS4002DC	Algorithms & Data Structures	2.5
EE4501DC	Computer Architecture and C programming	2.5
EE4502DC	Digital Logic and Computer Organisation	2.5
EE4503DC	Circuit Analysis	2.5
EE4504DC	Linear Systems, Signals and Control	2.5

   If the required subject is not available as a deficiency course, the student may follow courses from a bachelor's programme. If necessary, he may in this case make use of the available transitional regulation (ref. article 25).

Article 21 – Bridging programmes for professional education graduates

1. Students having obtained a relevant 'HBO degree' from a Dutch institute of professional education in Electrical Engineering (Elektrotechniek), Embedded Systems or Computer Science (Technische Informatica, HBO-ICT track Systems and Networking Engineering) can gain access to the Master's degree programme via a bridging programme. The bridging programme consists of a minimum 47 credits in the field of calculus, mathematical modelling, electrical engineering and computer science.
2. The bridging programme consists of:

Code	*Name*	*EC*
CSE1300	Reasoning and Logic	5
WI1708TH1	Analysis 1	3
WI1708TH2	Analysis 2	3
WI1807TH1	Linear Algebra	3
WI1909TH	Differential Equations	3
CSE2430	Operating Systems	5
CSE1210	Probability Theory and Statistics	5
EE3D11	Computer Architecture and Organisation	5
EE2S11	Signals and Systems	5
EE2S21	Systems and Control	5

For students with an 'HBO degree' Technische Informatica		
CSE2420	Digital Systems	5
For students with an 'HBO degree' Electrical Engineering:		
TI1316TH/CSE1305	Algorithms and Data Structures	5

3. Students will gain access to the Master's degree programme in Embedded Systems when they have obtained their HBO degree, fulfilled the language requirements of the master programme and earned a 'V' (passed) or a mark greater than or equal to 6 for all the courses in their bridging programme.

Part 2F Sustainable Energy Technology

Article 22A – General

1. The Master's degree programme in Sustainable Energy Technology consist of a compulsory core and a profile cluster. The following profile clusters are offered:
    - Autonomous systems
    - Solar systems
    - Bio/solar systems
    - Wind & economics
    - Solar & economics
    - Biomass & economics

    Students choose one of these profile clusters according to the content of their prior degree programme.
3. An individual exam programme (IEP) is composed as follows:
    1. a common core worth 24 credits;
    2. a profile cluster worth 36 credits;
    3. an elective space worth 15 credits and
    4. a graduation project worth 45 credits.

Article 22B – 4TU character of the Master's degree programme Sustainable Energy Technology

1. The Master's degree program in Sustainable Energy Technology is a 4TU MSc program. The program is offered at TU/e, TUD (Delft University of Technology) and UT (University of Twente). The programs have similar learning objectives. The programme at each university is different. Each programme has a different CROHO registration (programme registration according to the WHW).
2. After a student is formally enrolled in the Master's programme in Sustainable Energy Technology at one of the 3 universities he or she will also obtain a secondary enrolment (neveninschrijving) at the 2 other universities.
3. Students are allowed to choose elective subjects from the lists of elective and core courses from each of the 3 programmes, after approval by the Board of examiners of the home university.

Article 23 – Programme details

1. The core courses are:

Code	*Name*	*EC*
SET3013	Renewable Energy	4
WM0201SET	Technical writing	2
SET3060	Energy System Optimization	5
SET3055	Economics and Regulations of sustainable energy	4
SET3815-M	Matlab for Sustainable Energy Technology	2
SET3815-Pr	System Integration Project	7

2. The profile clusters are composed of combinations of three profiles. Students follow all courses of the three profiles:

Profile Cluster	*Profiles*					
	Bio	Power	Economics	Solar	Storage	Wind
Autonomous systems				X	X	X
Solar systems		X		X	X	
Bio/solar systems	X			X	X	

Wind & economics	X	X			X
Solar & economics	X	X	X		
Biomass & economics	X	X		X	

The profile courses are:

Code	*Name*	*EC*
Profile 'Biomass'		
SET3070	Thermochemistry of biomass conversion	4
CH3061	Multiphase reactor engineering	4
SET3311	Green Chemistry and Sustainable Technology	4
Profile 'Power'		
SET3095	Electronic power conversion	4
SET3065	Intelligent electrical power grids	4
EE4545	Electric power systems of the future[50]	4
	Or	
EE4536	AC and DC Microgrids[51]	4
Profile 'Economics and Society'		
WM0931SET	Sustainable Energy Innovations and Transitions	4
WM0637SET	Economic Policy for Sustainable Energy	4
WM0638SET	Sustainable Business Venturing	4
Profile 'Solar'		
ET4376	Photovoltaics Basics	4
ET4377	Photovoltaics Technologies[52]	4
ET4378	Photovoltaics Systems[53]	4
Profile 'Storage'		
SET3080	The necessity of storage technology	4
CH3222	Energy Storage in Batteries	4
SET3085	Hydrogen technology	4
Profile 'Wind'		
AE4W02	Introduction to wind turbines: physics and technology	4
AE4W13	Site conditions for Wind Turbine Design	4
AE4W09	Wind Turbine Design	4

3. The elective space should be used for one of more of the following purposes:
   - To gain work experience (SET3822 Internship MSc SET, 15 credits),
   - To gain research experience (ET4399 Extra Project, max. 15 credits),
   - To broaden their knowledge of the SET field[54],
   - To deepen knowledge of the SET profile (see below), profile electives
   - To gain entrepreneurship skills (max. 6 credits, see below)
   - To further develop language skills (max. 3 credits, see below).

[50] Either Electric power systems of the future or AC and DC Microgrids must be chosen.
[51] Either Electric power systems of the future or AC and DC Microgrids must be chosen.
[52] This course is part of the TU Delft MicroMasters Solar Energy Engineering.
[53] This course is part of the TU Delft MicroMasters Solar Energy Engineering.
[54] All courses from other profiles may be chosen.

For students who wish to deepen their knowledge of their SET profile, each profile offers an advanced course. Each profile offers an advanced course which could be made compulsory by the thesis supervisor.

Other courses will be taken into consideration if and when submitted to the Board of Examiners.

Profile electives courses

Profile	*Code*	*Name*	*EC*
	SET3822	Internship	Max 15
	ET4399	Extra Project	Max 15
	EWI4020	Joint Interdisciplinary Project	15
Biomass	ME45135	Process plant design	5
	ME45000	Advanced Heat Transfer	3
	ME45165	Equipment for Mass and Heat Transfer	5
	ME45070	Advanced Reaction & Separation Systems	5
	ME45160	Advanced Applied Thermodynamics	5
Power	ET4103	High voltage constructions	4
	ET4117	Electrical machines and drives	4
Economics & Society	WM0903TU	Technology and global development	
	SEN1531	Design of Integrated Energy Systems	5
	SEN1211	Agent-Based Modelling	5
	MOT9515	CleanTech Business Study	5
	MOT9612	Business development lab	5
	MOT1421	Economic Foundations	5
	SPM9716	Cost-Benefit Analysis: Theory and Applications	4
Solar	ET4379	Photovoltaics lab	4
	EE4645	PV materials processing & characterization	3
Storage	SET3090	Fossil-Free Fuel and Feedstock	4
	CH3531	Functional Ceramics	3
	ME45100	Fuel Cell Systems	3
	CH3562	Nanoparticle Technology	3
	CH3522	Electrochemistry for Renewable Energy 2: Applications (ERE12)	3
	CH3531	Functional Ceramics	3
	CH3681A	Reactors and Kinetics	6
	LM3741	Fermentation Technology & Environmental Biotechnology	6
	AP3311D	Neutrons, X-Rays and Positrons for Studying Microscopic Structures and Dynamics	6
Wind	OE44120	Offshore wind farm design	4
	AE4T40	Airborne wind energy	3
	AE4205	Multidisciplinary design optimization for aerospace applications	4
	AE4262	Combustion for propulsion and power technologies	4
	AESM1306SET	Geothermal Energy & Applications	4
	OE44075	Introduction to Ocean Energy Technologies	4

Entrepreneurship

Code	*Name*	*EC*
MOT1461	Financial Management	5
MOT1533	High-Tech Marketing	5
MOT9556	Corporate entrepreneurship	6
WM0516TU	Turning Technology into Business	6
WM0506TU	Ready to startup	6

Language courses

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1136TU	Written English for technologists-1	3
WM1102TU	Written English for technologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM1117TU	Dutch intermediate 1	3

Please note:

Language courses may only be chosen if required. Placement tests showing the necessity to take one or more of these courses must be taken and submitted to the Board of Examiners.

Other

Code	*Name*	*EC*
AESM1306SET	Geothermal Energy & Applications	4

4. The graduation project (SET3901) worth 45 credits is performed under supervision of one of the research groups affiliated with one of the profiles, under condition that all courses within the profile have been completed (12 EC). It is subject to the Rules and Regulations of the Board of Examiners of the faculty of EEMCS[55] and what is stated in article 3 of this appendix.

Article 24 – Bridging Programme

There are no bridging programmes for Sustainable Energy Technology.

Part 3 Programme transitions

Article 25A – Course equivalencies

The following courses or course combinations are considered equivalent. Please note that all other changes to the IEP have to be approved by the Board of Examiners.

Course no longer on offer				Equivalent course(s) on offer		
Code	*Name*	*EC*		*Code*	*Name*	*EC*
TW2010	Linear Algebra 2	6		TW2011	Linear Algebra 2	6
CH3253SET	Thermochemistry of Biomass Conversion	4		SET3070	Thermochemistry of Biomass Conversion	4

[55] Http://studenten.tudelft.nl/en/eemcs/regulations

ET4119	Electronic Power Conversion	4		SET3095	Electronic Power Conversion	4
CH3212SET	The Necessity of Storage Technology	4		SET3080	The Necessity of Storage Technology	4
CH3232SET	Hydrogen Technology	4		SET3085	Hydrogen Technology	4
CH3222SET	Energy Storage in Batteries	4		CH3222	Energy Storage in Batteries	4
CH3242SET	Fossil-Free Fuel and Feedstock	4		SET3090	Fossil-Free Fuel and Feedstock	4
AE3W02TU	Introduction to wind energy/turbine	4		AE4W02TU	Introduction to wind turbines: physics and technology	4
ET4375	Finite Element Modeling for Electrical Energy Applications	4		EE4375	Finite Element Modeling for Electrical Energy Applications	4
AP3421-D	Fundamentals of Quantum Information	4		AP3421	Fundamentals of Quantum Information	4
EE4C09	Structured Electronic Design	5		EE4109	Structured Electronic Design	5
SET3815-M	Matlab for Sustainable Energy Technology	2	And	SET3815	System Integration Project	9
SET3815-Pr	System Integration Project	7				
IN4176	Functional Genomics & Systems Biology	6		IN4176	Algorithms for network-based bioinformatics	6
IN4329	Advanced Bioinformatics	4		IN4329	Recent topics in bioinformatics	4
IN4391	Distributed Computing Systems	5		IN4391	Distributed Systems	5
CS4180	Deep Learning	6		CS4240	Deep Learning	5
IN4085	Pattern Recognition	6		CS4220	Machine Learning 1	5
IN4176	Functional Genomics & Systems Biology	6		CS4176	Algorithms for network-based bioinformatics	5
IN4329	Advanced Bioinformatics	4		CS4329	Recent topics in bioinformatics	5

Older course equivalencies:

Course no longer on offer				Equivalent course(s) on offer		
Code	*Name*	*EC*		*Code*	*Name*	*EC*
SET3012	Renewable Energy	4		SET3013	Renewable Energy	4
WB4495-09TU	Fuel Cell Systems	3		ME45100	Fuel Cell Systems	3
ET4003	Power Electromagnetics	4		EE4550	Electromagnetic Modeling in Power	5

					Engineering	
ET4235	Statistical Signal Processing	4		EE4C03	Statistical Digital Signal Processing and Modeling	5
ET4246	Introduction Computer System Engineering	2		EE4C01	Profile Orientation and Academic Skills	3
ET4248	Introduction to Microelectronics	3		EE4C01	Profile Orientation and Academic Skills	3
ET4295	Introduction to Analog CMOS Design	4		EE4520	Analog CMOS design I	3
ET4356 (-13)	Electromagnetics	5		EE4C05	Electromagnetics	5
ET4359	Advances in Networking	5		CS4055	High-performance data networking	5
ET4385	Introduction to Telecommunications & Sensing Systems	2		EE4C01	Profile Orientation and Academic Skills	3
ET4392	Physics of Semiconductor Devices	5		EE4585	Semiconductor Device Physics	5
WI4301IN	Statistical Multivariate Data Analysis	4		CS4070-d2	Multivariate Data Analysis part 2	2.5
WI4202	Stochastic Processes	6		WI4430	Martingales, Brownian Motion and Stochastic Calculus	6
IN4340	Embedded Computer Architecture	5		ET4074	Modern Computer Architectures	5
SET3012	Renewable Energy	4		SET3013	Renewable Energy	4
WB4425-09TU	Fuel Cell Systems	3		ME45100	Fuel Cell Systems	3
SC4025	Control Theory	6		SC42015	Control Theory	6
SC4026	Control System Design	3		SC42000	Control System Design	3
SC4040	Filtering and Identification	6		SC42025	Filtering and Identification	6
SC4081-10	Knowledge Based Control Systems	4		SC42050	Knowledge Based Control Systems	4
SC4091	Optimization in Systems and Control	4		SC42055	Optimization in Systems and Control	4
SC4092	Modelling and Nonlinear Systems Theory	4		SC42060	Modelling and Nonlinear Systems Theory	4
SC4160	Modelling and Control of Hybrid Systems	3		SC42075	Modelling and Control of Hybrid Systems	3
SC4210	Vehicle Mechatronics	4		ME41110	Vehicle Mechatronics	4
WB2305	Digital Control	3		SC42095	Digital Control	3
SPM5430IA	Service Systems Engineering	4		SEN1621	I&C Service Design	5
IN4304	Empirical research methods	5		CS125	Seminar research methods for Data Science	5
ET4293	Digital IC Design	4		EE4610 and EE4615	Digital IC Design I and Digital IC Design II	3 and 3
ET4010	Wavefield Imaging	4		EE4595	Wavefield imaging	5
IN4073TU	Embedded Real Time Systems	6		ESxxxx	Embedded Systems Laboratory	5
IN4342	Embedded Systems Laboratory	5		ESxxxx	Embedded Systems Laboratory	5
SEN1511	Engineering Optimization and Integrating Renewables in Electricity Markets	5		SET3060	Energy System Optimization	5
IN4393	Computer Vision	5		CS4245	Seminar Computer Vision by Deep Learning	5
SET3041	Energy from Biomass	4		CH3253SET	Thermochemistry of biomass conversion	4
IN4320	Machine Learning	5		CS4230	Machine Learning 2	5
ET4389	Complex Networks from Nature to Man-made Networks	4		EE4389	Modeling and Data Analysis in Complex Networks	4

Article 25B – Transitional regulations

1. For MSc Computer Science:

Transitional regulation Special Programme Bioinformatics

Courses from Leiden University continue to exist and can therefore still be followed. Contact the Special Programme Coordinator for more information.

Transitional regulation IN4320 Machine Learning

Students of cohort 2019 and before who already have the course code IN4320 Machine Learning (5EC) in their IEP may follow CS4230 Machine Learning 2 (5EC) in 2019-2020 to receive credit for IN4320. If the student is not successful in completing IN4320 in 2019-2020 the student must change the IEP to CS4230 because the course is not available anymore. Students who do not have this course IN4320 in their IEP and have not completed IN4320 successfully must use course code CS4230 Machine Learning 2 (5EC).

Transitional regulation IN4085 Pattern Recognition

Students of cohort 2019 and before who already have the course code IN4085 Pattern Recognition (6EC) in their IEP may follow CS4220 Machine Learning 1 (5EC) in 2019-2020 to receive credit for IN4085. If the student is not successful in completing IN4085 in 2019-2020 the student must change the IEP to CS4220 because the course is not available anymore. Students who do not have this course IN4085 in their IEP and have not completed IN4085 successfully must use course code CS4220 Machine Learning 1 (5EC).

Transitional regulation IN4176 Functional Genomics & Systems Biology

IN4176 Functional Genomics & Systems Biology (6EC) has been changed to CS4176 Algorithms for network-based bioinformatics (5EC). Students who already have the course IN4176 in the IEP, but have not yet successfully completed the course, must use the new course code CS4176 and change the IEP.

Transitional regulation IN4329 Advanced Bioinformatics

IN4329 Advanced Bioinformatics (4EC) has been changed to CS4329 Recent topics in bioinformatics (5EC). Students who already have the course IN4329 in the IEP, but have not yet successfully completed the course, must use the new course code CS4329 and change the IEP.

2. For MSc Embedded Systems:

Transitional regulation IN4390 Quantitative Evaluation of Embedded Systems

Students who started their master's programme in Embedded Systems in the academic year 2018-2019 are not required to include this course in their IEP (they have to do an extra specialisation course instead). Students who started the master's programme *before 2018-2019* and *new students per 2019-2020*, however, do have to take this course.

3. For MSc Electrical Engineering:

From academic year 2019 the track Telecommunications and Sensing Systems (TSS) is replaced with a new track, Wireless Communication and Sensing. From September 2019 new students will not be admitted anymore to the TSS track. All students registered for TSS at that point will be allowed to finish the track.

Part 4 – Language requirements

Article 26 – Language requirements (annex art. 3 TER)

Language level for individuals holding a higher professional education degree (c)

The English language, through the successful completion of one of the following tests:
- A TOEFL iBT (Test of English as a Foreign Language internet-Based Test) with an overall band score of at least 90, or
- an IELTS (academic version) with an overall Band score of at least 6.5, or
- Cambridge Assessment English:
    - C1 Advanced (Certificate of Advanced English) with an overall score of at least 176.
    - C2 Proficiency(Certificate of Proficiency in English) with an overall score of at least 180.

Certificates must have been completed successfully before the start of the bridging programme.

The following candidates shall be exempted from the requirement to pass an English language test:
- Nationals from the USA, UK, Ireland, Australia, New Zealand or Canada
- Applicants with a Dutch Pre-university (VWO) certificate
- Applicants who have obtained a higher professional education degree in an English-language programme.

Language level for individuals holding a foreign degree (d)

The English language, through the successful completion of one of the following tests:
- A TOEFL iBT (Test of English as a Foreign Language internet-Based Test) with an overall band score of at least 90 and a minimum score of 21 for each section, or
- an IELTS (academic version) with an overall Band score of at least 6.5 and a minimum score of 6.0 for each section, or
- Cambridge Assessment English:
    - C1 Advanced (Certificate of Advanced English) with an overall score of at least 176 and a minimum of 169 for each section.
    - C2 Proficiency(Certificate of Proficiency in English) with an overall score of at least 180 and a minimum of 169 for each section.

Certificates older than two years shall not be accepted.

The following candidates shall be exempted from the requirement to pass an English language test:
- Nationals from the USA, UK, Ireland, Australia, New Zealand or Canada
- Applicants who have obtained a Bachelor’s degree in one of the countries mentioned.