

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

2022 – 2023

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 to faculty EEMCS TER 2022-2023

Extension of the conditional admission (Zachte Knip)

- Article 3A, sub 4
- Article 3B, sub 4
- Article 3C, sub 4

Registration for examinations

- Article 13
- Article 14

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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.

1. The following terms are to be defined as follows:

1	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
2	programme	the Master's degree programme as denoted in Article 7.3a section 1, of the Act
3	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
4	cohort	the group of students who have registered for a degree programme for the first time in a given academic year
5	quarter	half of a semester, period of 10 weeks as stipulated in the academic calendar
6	examination period	the period where exams and resits will take place, as stipulated in the academic calendar. Only resits will take place in week 5.3. See also MyTimetable.tudelft.nl
7	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
8	practical exercise	course or component of a course aimed at the acquisition of particular skills. The following can be understood as practical exercises: <ul style="list-style-type: none"> • 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;

		<ul style="list-style-type: none"> participating in fieldwork or an excursion; conducting tests and experiments; participating in other educational activities aimed at enabling participants to attain certain skills;
9	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
10	interim 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
11	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
12	Board of Examiners	the programme's Board of Examiners, which has been installed in accordance with Article 7.12 of the Act
13	examiner	the individual who, in line with Article 7.12, section 3 of the Act, has been appointed to set the examinations
14	Implementation Regulations	the Implementation Regulations which form part of these Teaching and Examination Regulations
15	credit/EC	a credit awarded in line with the European Credit Transfer System (ECTS); one credit denotes a study load of 28 hours
16	working day	Monday to Friday with the exception of recognised national public holidays and the collective closure days
17	study guide	the digital guide to the programme containing specific information pertaining to the various subjects (www.studiegids.nl)
18	institute	Delft University of Technology
19	electronic learning environment	an electronic system designed for the exchange of teaching information e.g. Brightspace
20	student registry system	an electronic system designed for the registration of study progress, e.g. Osiris; including MyTUDelft
21	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
22	IEP	Individual Exam Programme
23	academic year	the period from 1 September till 31 August of the following calendar year
24	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)
25	programme duration	the duration starting from the enrolment of the student till the last examination
26	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.

3. Where these Regulations refer to examinations, they also refer to interim examinations, with the exception of the first two sentences of Article 19, sub 2.
4. A written or oral examination can also be administered digitally and/or online. Where these Regulations refer to examinations, this also refers to digital and/or online examinations.
5. In these regulations, unforeseen circumstances and/or measures are defined as large-scale force majeure situations such as a (new) pandemic. This allows TU Delft to anticipate quickly and efficiently to adapt education and facilities when necessary.

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 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;
- Or
- Bachelor degree in Mathematics (Wiskunde) from a Dutch research university;
- Or
- A completed bridging programme in Applied Mathematics 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

Individuals holding a foreign bachelor's degree will be assessed on an individual basis by the admission committee.

a. The following quantitative admission requirements must be met:

- Bachelor's degree in (Applied) Mathematics or equivalent, 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-diploma/admission-requirements/#c41762>.¹ If the country is not listed in the overview, the required minimum CGPA is 75%,
- Sufficient knowledge (study load) in and good scores for Applied Mathematics key subjects (see below under b), and
- English language proficiency, the requirements can be found in article 26 in the Implementation Regulations (annex).

b. The following qualitative admission requirement must be met:

- For the master's degree programme in Applied Mathematics sufficient knowledge of the following key subjects is required:
- optimisation;

¹More 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/>).

- applied analysis (numerical analysis, PDEs);
- abstract analysis (measure theory, metric spaces);
- probability and statistics.

In addition, candidates are required to submit a CV, two reference letters² and a motivation statement.

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

3. Conditional admission (due to COVID-19)

For the 2022-2023 academic year, in the context of the outbreak of COVID-19, students who were enrolled at a Dutch university or HBO (University of Applied Sciences) in the 2021-2022 academic year may be conditionally admitted provided that, on 31 August 2022, they:

- have a deficit not exceeding 10 ECTS for the Bachelor's degree audit of the Bachelor's programme referred to in this article and have in any event successfully completed their final bachelor project, or
- have a deficit not exceeding 10 ECTS for completion of the bridging programme referred to in this article.

If, on 31 August 2023, students have not met the admission requirements referred to in this article, they will be unenrolled from the degree programme.

The foregoing does not apply to the student who used the regulation applicable in the academic years 2020/2021 or 2021/2022 in connection with the Covid-19 outbreak for conditional admission in the event of a deficit not exceeding 15 ECTS.

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 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;

Or

- Bachelor degree in Electrical Engineering or Computer Science & Engineering (TI) from a Dutch HBO institution in combination with a completed bridging programme in Computer Engineering from the TU Delft;

Or

Bachelor's degree in Mechanical Engineering, Applied Physics and Aerospace Engineering from Delft University of Technology and a completed bridging programming in Computer Engineering from TU Delft; Students who possess a Dutch bachelor's 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 Two reference letters are only required when the applicant simultaneously files an application for a scholarship listed on the website <https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/required-documents/#c425778>

2. Degrees from foreign higher education institutions

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

- Bachelor's 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-diploma/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,
- For the master's degree programme in Computer Engineering the key subjects are defined as:
 - Mathematics (Calculus, Linear Algebra, Numerical Analysis, Differential Equations, Probability and Statistics)
 - Computer Architecture
 - Programming (especially C language)
- 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.

In addition, candidates are required to submit a CV, two reference letters⁴ and a motivation statement.

3. Admission to the programme 2023-2024

Article 3B2 applies, but additionally:

1. For EER students with an international BSc degree, a rolling admission applies with an application deadline of April 1st 2023. Enrolment is only possible per September 1st.
2. For non-EER students with an international BSc degree the application deadline is January 15th 2023. There will be a selective admission on the basis of submitted materials. Enrolment is only possible per September 1st.

Details of the application procedure and deadlines are published on the website www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/

4. Conditional admission (due to COVID-19)

For the 2022-2023 academic year, in the context of the outbreak of COVID-19, students who were enrolled at a Dutch university or HBO (University of Applied Sciences) in the 2021-2022 academic year may be conditionally admitted provided that, on 31 August 2022, they:

- have a deficit not exceeding 10 ECTS for the Bachelor's degree audit of the Bachelor's programme referred to in this article and have in any event successfully completed their final bachelor project, or

³More 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>).

⁴ Two reference letters are only required when the applicant simultaneously files an application for a scholarship listed on the website <https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/required-documents/#c425778>

- have a deficit not exceeding 10 ECTS for completion of the bridging programme referred to in this article.

If, on 31 August 2023, students have not met the admission requirements referred to in this article, they will be unenrolled from the degree programme.

The foregoing does not apply to the student who used the regulation applicable in the academic years 2020/2021 and 2021/2022 in connection with the Covid-19 outbreak for conditional admission in the event of a deficit not exceeding 15 ECTS.

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 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;

Or

- Bachelor's degree in Computer Science from a Dutch research university;

Or

- Bachelor's degree in Electrical Engineering or Applied Mathematics from Delft University of Technology, and a completed bridging programming in Computer Science & Engineering from TU Delft;

Or

- Bachelor's 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's 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. The admission committee will uphold the same qualitative requirements as mentioned in section 3C2 below: first and second item (no GRE required).

2. Degrees from foreign higher education institutions

Individuals holding a foreign bachelor's 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 or equivalent, 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-diploma/admission-requirements#c425721>).⁵ If the country is not listed in the overview, the required minimum CGPA is 75%, and

⁵More 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>).

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

The following qualitative admission requirements also apply:

- Good academic performance in Computer Science subjects with a combined study load of at least 120 EC, of which at least 100 EC in key subjects and minimum number of EC per key area as indicated below,

- For the master's degree programme in Computer Science the key subjects are defined as:

1. Mathematics and Modelling (Calculus, Linear Algebra, Probability Theory and Statistics) – minimum 15 EC
2. Software Development Fundamentals (Object Oriented Programming, Software Quality and Testing, Software Engineering Methods, Concepts of Programming Languages, Object Oriented Programming Project, Software Project) – minimum 30 EC
3. Computer Systems (Computer Organisation, Computer Networks) – minimum 10 EC
4. Fundamental Computer Science (Logic, Algorithms and Data Structures, Algorithm Design, Computability) – minimum 15 EC
5. Data and Information Systems (Machine Learning, Data Management, Web- & Database Technology) – minimum 15 EC;

- 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 expects applicants to 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.

In addition, candidates are required to submit a CV, two reference letters⁶ and a motivation statement.

3. Admission to the programme 2023-2024

Article 3C2 applies, but additionally:

1. For EER students with an international BSc degree, a rolling admission applies with an application deadline of April 1st 2023. Enrolment is only possible per September 1st.
2. For non-EER students with an international BSc degree the application deadline is January 15th 2023. There will be a selective admission on the basis of submitted materials. Enrolment is only possible per September 1st.
3. The MSc Computer Science strives for diverse and balanced student population both at programme and at track level.

Details of the application procedure and deadlines are published on the website

www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/

4. Conditional admission (due to COVID-19)

For the 2022-2023 academic year, in the context of the outbreak of COVID-19, students who were enrolled at a Dutch university or HBO (University of Applied Sciences) in the 2021-2022 academic year may be conditionally admitted provided that, on 31 August 2021, they:

⁶ Two reference letters are only required when the applicant simultaneously files an application for a scholarship listed on the website <https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/required-documents/#c425778>

- have a deficit not exceeding 10 ECTS for the Bachelor's degree audit of the Bachelor's programme referred to in this article and have in any event successfully completed their final bachelor project, or
- have a deficit not exceeding 10 ECTS for completion of the bridging programme referred to in this article.

If, on 31 August 2023, students have not met the admission requirements referred to in this article, they will be unenrolled from the degree programme.

The foregoing does not apply to the student who used the regulation applicable in the academic years 2020/2021 and 2021/2022 in connection with the Covid-19 outbreak for conditional admission in the event of a deficit not exceeding 15 ECTS.

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 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;

Or

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

Or

Bachelor's degree in Mechanical Engineering, Aerospace Engineering and Applied Physics from Delft University of Technology, and a completed bridging programming in Electrical Engineering from TU Delft;

Students who possess a Dutch bachelor's 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, 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).

⁷More 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/>).

The following qualitative admission requirements also apply:

- scores for key subjects must be good,
- For the master's degree programme in Electrical Engineering the key subjects are defined as:
 - Mathematics (Differential Equations, Linear Algebra, Stochastics)
 - Physics (Electromagnetics, Electricity and Magnetism)
 - Electrical circuits (Electronics, Linear and Integrated Circuits)
 - Signals and Systems (Signal Processing, Systems and Control)
- 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 Electrical 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.

In addition, candidates are required to submit a CV, two reference letters⁸ and a motivation statement.

3. Admission to the programme 2023-2024

Article 3D2 applies, but additionally:

1. For EER students with an international BSc degree, a rolling admission applies with an application deadline of April 1st 2023. Enrolment is only possible per September 1st.
2. For non-EER students with an international BSc degree the application deadline is January 15th 2023. There will be a selective admission on the basis of submitted materials. Enrolment is only possible per September 1st.
3. The MSc Electrical Engineering strives for diverse and balanced student population both at programme and at track level.

Details of the application procedure and deadlines are published on the website www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/

4. Conditional admission (due to COVID-19)

For the 2022-2023 academic year, in the context of the outbreak of COVID-19, students who were enrolled at a Dutch university or HBO (University of Applied Sciences) in the 2021-2022 academic year may be conditionally admitted provided that, on 31 August 2022, they:

- have a deficit not exceeding 10 ECTS for the Bachelor's degree audit of the Bachelor's programme referred to in this article and have in any event successfully completed their final bachelor project, or
- have a deficit not exceeding 10 ECTS for completion of the bridging programme referred to in this article.

If, on 31 August 2023, students have not met the admission requirements referred to in this article, they will be unenrolled from the degree programme.

The foregoing does not apply to the student who used the regulation applicable in the academic years 2020/2021 and 2021/2022 in connection with the Covid-19 outbreak for conditional admission in the event of a deficit not exceeding 15 ECTS.

⁸ Two reference letters are only required when the applicant simultaneously files an application for a scholarship listed on the website <https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/required-documents/#c425778>

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;

Or

Bachelor's degree in Mechanical Engineering, Applied Physics and Aerospace Engineering from Delft University of Technology and a completed bridging programming in Embedded Systems from TU Delft;

Or

- 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's 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/onderwijs/toelating-en-aanmelding/msc-international-diploma/admission-requirements#c425721>).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,
- for the master's degree programme in Embedded Systems the key subjects are defined as:
 - Mathematics (Calculus, Linear Algebra, Numerical Analysis, Differential Equations, Probability and Statistics)
 - Computer Architecture
 - Programming (especially C language);

⁹More 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/>).

- 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.

In addition, candidates are required to submit a CV, two reference letters¹⁰ and a motivation statement.

3. Admission to the programme 2023-2024

Article 3B2 applies, but additionally:

1. For EER students with an international BSc degree, a rolling admission applies with an application deadline of April 1st 2023. Enrolment is only possible per September 1st.
2. For non-EER students with an international BSc degree the application deadline is January 15th 2023. There will be a selective admission on the basis of submitted materials. Enrolment is only possible per September 1st.

Details of the application procedure and deadlines are published on the website

www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/

4. Conditional admission (due to COVID-19)

For the 2022-2023 academic year, in the context of the outbreak of COVID-19, students who were enrolled at a Dutch university or HBO (University of Applied Sciences) in the 2021-2022 academic year may be conditionally admitted provided that, on 31 August 2022, they:

- have a deficit not exceeding 10 ECTS for the Bachelor's degree audit of the Bachelor's programme referred to in this article and have in any event successfully completed their final bachelor project, or
- have a deficit not exceeding 15 ECTS for completion of the bridging programme referred to in this article.

If, on 31 August 2023, students have not met the admission requirements referred to in this article, they will be unenrolled from the degree programme.

The foregoing does not apply to the student who used the regulation applicable in the academic years 2020/2021 and 2021/2022 in connection with the Covid-19 outbreak for conditional admission in the event of a deficit not exceeding 15 ECTS.

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.

¹⁰ Two reference letters are only required when the applicant simultaneously files an application for a scholarship listed on the website <https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/required-documents/#c425778>

- 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;

Or

- Bachelor's degree Molecular Science & Technology from Leiden University;

Or

- Bachelor's degree in Astronomy (Sterrenkunde), Physics (Natuurkunde), or Chemistry (Scheikunde) from a Dutch research university.

Students who possess a Dutch bachelor's 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's degree will be assessed on an individual basis by the admission committee. The following general selection requirements must be met:

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

-A minimum bachelor's Cumulative Grade Point Average (CGPA), specific requirements are defined per country (<https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/admission-requirements#c425721>).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:

- Academic performance in key subjects with a combined study load of at least 100 EC in engineering subjects - of which at least 80 EC in key subjects and of which minimally 20 EC in Mathematics;

- For the master's degree programme in Sustainable Energy Technology, the key subjects are defined as courses in these 4 areas:

- Mathematics, minimum 20 EC;
- Physics;
- Chemistry;
- Electrical Engineering.

Examples of subjects in these areas and other engineering subjects can be found on [the website](#).

In addition, candidates are required to submit a CV, two reference letters¹² and a motivation statement.

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

Details of the application procedure and deadlines are published on the website www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/

¹¹More 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 Two reference letters are only required when the applicant simultaneously files an application for a scholarship listed on the website <https://www.tudelft.nl/onderwijs/toelating-en-aanmelding/msc-international-diploma/required-documents/#c425778>

3. Conditional admission (due to COVID-19)

For the 2022-2023 academic year, in the context of the outbreak of COVID-19, students who were enrolled at a Dutch university or HBO (University of Applied Sciences) in the 2021-2022 academic year may be conditionally admitted provided that, on 31 August 2022, they:

- have a deficit not exceeding 10 ECTS for the Bachelor's degree audit of the Bachelor's programme referred to in this article and have in any event successfully completed at least their final bachelor project.

If, on 31 August 2023, students have not met the admission requirements referred to in this article, they will be unenrolled from the degree programme.

The foregoing does not apply to the student who used the regulation applicable in the academic years 2020/2021 and 2021/2022 in connection with the Covid-19 outbreak for conditional admission in the event of a deficit not exceeding 15 ECTS.

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 meet the following specific final attainment levels:
The graduate
 - a) 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.
 - b) Is able to develop his or her own mathematical knowledge and insights in a focused and methodological fashion.
 - c) Is able to develop and analyse mathematical models for problems from other disciplines and assess their usefulness.
 - d) Has a systematic approach, characterised by the application of mathematical theories and development of mathematical methods and models, has a critical attitude.
 - e) 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.
 - f) Can work in a team and is able to communicate mathematical knowledge verbally and in writing to specialists and non-specialists.
 - g) Is aware of the professional, societal and ethical context in which mathematics is applied and is able to take this context into account 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. Scientific discipline

The graduate has sufficient knowledge, skills and a clear understanding of computer and embedded systems engineering, enabling the graduate to perform independent professional and scientific activities in this field at an academic level.

This consists of:

- a. an all-embracing view on computer engineering and embedded systems, their design and their application in systems of various sizes, including their evolution over time, demonstrated by a comprehensive approach in system design.
- b. the capability to analyse the functional behaviour of complex computer hardware and embedded systems in a structural way, using appropriate abstractions
- c. the ability to describe and evaluate the non-functional aspects of computation platforms (hardware and software) and the surrounding system (sensors and actuators), e.g. resource boundedness and dependability
- d. a thorough knowledge of state-of-the-art and emerging methods and technologies for computer and embedded systems engineering such as requirements engineering, hardware-software integration, performance modelling and analysis, validation and testing, computer architectures, computer arithmetic, compiler construction and code generation.

2. Doing research

The graduate is able to conduct research independently that contributes to the development of scientific knowledge about the application of computer and embedded systems engineering to address complex problems.

3. Designing

The graduate is able to design computer architectures and embedded systems that satisfy functional and non-functional requirements, taking into account the performance of the system during its lifetime.

4. Scientific approach

The graduate has a scientific approach to complex problems and ideas, i.e., the graduate can define a research or engineering problem, choose an appropriate approach, and complete that project.

5. Intellectual skills

The graduate has intellectual skills befitting an academic graduate.

This includes:

- a. the ability to reflect critically, reason and form opinions
- b. the capability to continue their studies in a manner that is largely self-directed, self-regulated and self-motivated (lifelong learning)

6. Cooperating and communicating

The graduate is capable of working in interdisciplinary teams, performing research or design activities and communicating easily in English, both in writing and orally.

This includes:

- a. the attitude to include other disciplines or involve practitioners of these disciplines in their work, where necessary
- b. the ability to collaborate in multi-disciplinary settings, where necessary

- c. the ability to communicate the results of their findings, thinking and decision-making processes at an international level.

7. Temporal and social context

The graduate is aware of actions and consequences related to these actions on society and vice versa.

This includes:

- a. being aware of the temporal, social and ethical context of science and technology (comprehension and analysis) and being able to integrate this context responsibly in their scientific work
- b. the ability to appraise costs and environmental issues in order to make optimal use of available resources

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, in Data Science and Technology or in Artificial Intelligence 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. Scientific discipline

The graduate has sufficient knowledge, skills and a clear understanding of computer and embedded systems engineering, enabling the graduate to perform independent professional and scientific activities in this field at an academic level.

This consists of:

- a. an all-embracing view on computer engineering and embedded systems, their design and their application in systems of various sizes, including their evolution over time, demonstrated by a comprehensive approach in system design.
- b. the capability to analyse the functional behaviour of complex computer hardware and embedded systems in a structural way, using appropriate abstractions
- c. the ability to describe and evaluate the non-functional aspects of computation platforms (hardware and soft- ware) and the surrounding system (sensors and actuators), e.g. resource boundedness and dependability

- d. a thorough knowledge of state-of-the-art and emerging methods and technologies for computer and embedded systems engineering such as requirements engineering, hardware-software integration, performance modelling and analysis, validation and testing, computer architectures, computer arithmetic, compiler construction and code generation.
2. Doing research
The graduate is able to conduct research independently that contributes to the development of scientific knowledge about the application of computer and embedded systems engineering to address complex problems.
3. Designing
The graduate is able to design computer architectures and embedded systems that satisfy functional and non-functional requirements, taking into account the performance of the system during its lifetime.
4. Scientific approach
The graduate has a scientific approach to complex problems and ideas, i.e., the graduate can define a research or engineering problem, choose an appropriate approach, and complete that project.
5. Intellectual skills
The graduate has intellectual skills befitting an academic graduate.
This includes:
 - a. the ability to reflect critically, reason and form opinions
 - b. the capability to continue their studies in a manner that is largely self-directed, self-regulated and self-motivated (lifelong learning).
6. Cooperating and communicating
The graduate is capable of working in interdisciplinary teams, performing research or design activities and communicating easily in English, both in writing and orally.
This includes:
 - a. the attitude to include other disciplines or involve practitioners of these disciplines in their work, where necessary
 - b. the ability to collaborate in multi-disciplinary settings, where necessary
 - c. the ability to communicate the results of their findings, thinking and decision-making processes at an international level.
7. Temporal and social context
The graduate is aware of actions and consequences related to these actions on society and vice versa.
This includes:
 - a. being aware of the temporal, social and ethical context of science and technology (comprehension and analysis) and being able to integrate this context responsibly in their scientific work
 - b. the ability to appraise costs and environmental issues in order to make optimal use of available resources.

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. Scientific discipline

He or she has knowledge and skills in disciplines of Sustainable Energy Technology and the attitude to apply these independently in the context of more advanced ideas and applications. This consists of:

- mastery of at least three advanced subject areas within the field of Sustainable Energy Technology (such as Solar Energy, Wind Energy, Biomass Energy, Energy Storage, Sustainable Electrical Power Engineering, Electric Mobility, and Economic and Societal topics).
- the ability to make connections between and to integrate different subject areas within the field of Sustainable Energy Technology.
- theoretical and practical skills to apply methods for truth-finding, theory development, modelling, interpretation, experimentation, simulation, reflection and decision making, independently.

2. Doing research

He or she is able to perform research independently that contributes to the development of scientific knowledge about the application of sustainable energy technologies to address complex, energy-related problems. This consists of:

- the ability to analyse research problems and to formulate answerable research questions.
- practical skills and the attitude to set up and carry out research and/or draw up and implement draft plans.
- the ability to reflect critically on the research of others and themselves, and to draw upon disciplines from other fields where necessary.

3. Designing

He or she is able to create independently designs for sustainable energy technologies to address complex, energy-related problems. This consists of:

- the ability of understanding a wide variety of different problems and to formulate these at an abstract level, whilst being able to see the relation between diverse problems at this abstract level.
- the capability of creating innovative technical designs, taking technical, economic and social feasibility issues into account, and with a focus on practical applications.
- knowledge of integration of energy technologies and of techniques to optimise the design of integrated energy systems and their parts.
- awareness of the applicability of research in technological developments.

4. Scientific approach

He or she has a systematic approach, characterised by the development and use of theories, models and coherent interpretations, has a critical attitude and has insight into the specific nature of science and technology related to sustainable energy technology.

5. Intellectual skills

He or she has intellectual skills befitting an academic graduate. This includes:

- the ability to reflect critically on his or her own research, thinking, and acting.

- the capability of formulating and defending opinions on research, design and developments in sustainable energy.
6. Co-operating and communicating
- He or she is capable of working in interdisciplinary teams, performing research or design activities and communicating easily in English, both in writing and orally. This includes:
- exhibiting professional behaviour.
 - the attitude and skills to perform project-based team work that addresses complex and interdisciplinary problems.
 - the capability to present clearly his or her own research results, to communicate with colleagues and to present results at conferences or as (part of) a publication to varied audiences, while being aware of the background and interest of the audience.
7. Temporal and social context
- He or she takes the consequences into account of his or her activities on society and vice versa. This includes:
- having sufficient understanding of the role of science and engineering in society to be able to reflect on this and develop an ethical attitude and practice his or her profession accordingly.
 - having knowledge of economic aspects of the energy system and of policy instruments that can influence these economic aspects.
 - having knowledge of sustainable energy-related developments in society.

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.¹³

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 7.3h of the law on Higher Education and Research, students can draw up a flexible exam programme that will lead to an examination. This program requires approval of the Board of Examiners prior to the start of the flexible exam programme. The programme must consist entirely or primarily of courses that are provided for the benefit of the program, but may be supplemented with courses that are provided by or for the benefit of other programmes.
2. Prior to the start of the flexible programme, the student must obtain advice from the academic counsellor and the relevant Director of Studies. The academic counsellor gives a recommendation on the study feasibility of the intended flexible exam programme. The Director of Studies gives a recommendation on the content of the intended flexible exam programme.
3. Unlike the IEP referred to in Article 4 of the Implementation Regulations, the intended flexible exam programme and recommendations by the academic counsellor and Director of Studies has to be submitted by the student for approval to the Board of Examiners prior to the start of the intended flexible exam 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.

¹³ See the Rules and Regulations of the board of examiners - Article 28 for the specific requirements of the individual Double Master's Degree programme <https://www.tudelft.nl/en/student/eemcs-student-portal/education/rules-regulations>

Part 3 Honours Programme and other annotations

Article 10A – Honours Programme (art.7.9b WHW)

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) may apply for the Delft University of Technology Honours programme for outstanding Master's students (HPM)¹⁴:
2. Based on the above criteria 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 before 1 March during the first year of their master programme.
4. The HPM will comprise at least 20 credits:
 - a. 5 credits must be completed in the Delft University of Technology-wide component of the HPM, which consists of this course: UD2012 Business Leadership for Engineers
 - 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. The Board of Examiners will be responsible for assessing whether all the requirements of the HPM have been met.
6. 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 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 programme 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. The Board of Examiners may 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 in the digital study guide.

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.

¹⁴ See also <https://www.tudelft.nl/en/student/eemcs-student-portal/education/honours-programme#c524593>

Part 4 Registering and withdrawing

Article 13 – Registration for written examinations

FSC right of approval; BoS advisory powers

1. Registration to participate in a written examination, including a written examination that is taken online remotely from the university, is compulsory and is done by entering the requested data into Osiris no later than fourteen calendar days before the examination. Students receive examination tickets by email as confirmation of their registration.
2. Students may submit a request to register for an examination after the deadline mentioned in subsection 1 has passed but no later than 6 calendar days before the examination in question, in Osiris by being placed on a waiting list. The request will be honoured providing that places are available in the room or rooms where the examination is scheduled to take place. The student will receive an exam ticket by email as confirmation.
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 an on-campus 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, then this examination will be invalidated, 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 the examination 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.
8. Sections 2 and 4 of this article do not apply to a written examination administered online remotely from the university.
9. If unforeseen circumstances or measures make it necessary to change the form or manner of taking the examination, the Board of Examiners may determine a different registration period in favour of the student.

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 is possible up to fourteen calendar days before the examination, unless otherwise stated in the study guide, and will take place in the manner indicated in the study guide for the examination or practical exercise in question. If, due to unforeseen circumstances or measures the form or manner of taking the examination changes, what is stated in the study guide will apply in full, unless the Dean decides to deviate from the manner or term for registration prescribed in the study guide.
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 calendar 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 i WHW)

FSC right of approval, BoS advisory powers

1. Examinations are set in the manner described in the appendix (Implementation Regulation) and in the digital study guide, i.e. orally, in writing or in any other way. Practical skills are tested during the hours allocated for practical training. In case of unforeseen circumstances or measures, the Board of Examiners may decide to deviate from the prescribed form. If the form of the examination is changed, students will be informed no later than 3 days before the examination. If an examination is held by means of online proctoring, this takes place in accordance with the TU Delft Regulation on online proctored examinations¹⁵.
2. The form of the examinations is specified in the study guide before the start of the concerned semester.
3. In the appendix (Implementation Regulation) and/or in the digital study guide, it is described at what times and the number of times the examinations can be taken, as well as their sequence, without prejudice to the provisions in these regulations regarding written and oral examinations
4. A student may participate in an examination for a subject no more than twice in one academic year, with the understanding that registration for an examination without timely withdrawal, as described in Article 15 - subsection 1, counts as participation.
5. The Board of Examiners may deviate from the provisions of this article in favour of the student in special cases.

¹⁵ More information <https://www.tudelft.nl/en/student/legal-position/education-regulations/online-proctored-examination-regulation>

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.¹⁶ The previous provision applies equally to examinations other than written examinations, unless this cannot be reasonably demanded of the programme. The times in which the examinations can be taken are:
 - the first opportunity is immediately after the teaching period for the course to which the examination in question relates,
 - the second opportunity is at a later point in the same academic year.
2. The frequency of examinations is laid down in the Implementation Regulations and the digital study guide. 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 and practical exercises

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 (see appendix I).
2. If there are entry requirements for a course these are specified in the study guide before the start of the teaching 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 Board of Examiners specifies otherwise. In case of group work, the examiner can decide to have more than one student sit the oral examination.
2. Oral examinations and group presentations shall not be public unless the Board of Examiners has decided otherwise.
3. In deviation from sub 2 a final presentation is given publicly except in special cases in which the Board of Examiners has decided otherwise, whether or not at the request of the student.¹⁷

¹⁶ This means that practical exercises such as projects (see definition in article 2, sub g.) by default do not have a repair option, unless stated otherwise in the digital Study Guide.

¹⁷ Final presentations are BSc End project and MSc thesis project.

4. An oral examination is preferably carried out by two examiners, and in any case if a student requests it. In case of unforeseen circumstances or measures, the Board of Examiners may determine that the oral examination will be conducted by one examiner. An in-person oral examination with one examiner must have at least an audio recording. An online oral exam with one examiner must have a video recording with audio.¹⁸
5. 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 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.
2. The examiner determines the result of the oral examination and publishes the result. This will take place no later than 15 working days after the oral examination, and no later than 5 working days after the last examination of a group that takes the same 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. Contrary to the previous provisions, results for examinations administered in the last regular examination period, as well as for resits from the first year of the BSc taken during the resit period, shall be determined, registered and published within five working days of the week following the week in which the examination was taken.
6. 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 inform the students as soon as possible.
7. 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.
8. 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 assessed work. During the inspection of the assessed work, it is not permitted to copy the underlying examination questions in any way, unless the examiner gives permission. On request students will be supplied with a copy of the assessed work.

¹⁸ More information <https://www.tudelft.nl/en/privacy-security/privacy/doelgroepen/student>

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 aforementioned location and time 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. During the discussion of the assessed work, it is not permitted to record and/or copy the underlying examination questions in any way, unless the examiner gives permission.
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 grade¹⁹ 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 delay in studies, acknowledged by and based on the TU Delft Profiling Fund Scheme.²⁰
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.

¹⁹ 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.

²⁰ More information <https://www.tudelft.nl/en/student/administration/profiling-fund>

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.
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.²¹

2. The request 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 or she mandates the academic counsellor on a case by case basis.

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.

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

²¹ More information and examples of adjustments to examinations can be found here:
<https://www.tudelft.nl/en/student/counselling/studying-with-a-disability>

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.
4. As a result of unforeseen circumstances or measures the Dean may decide to deviate from these regulations, including the actual design of the education and any compulsory attendance requirements. This also means that it is possible to deviate from the provisions of the study guide.

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. Students shall follow the degree programme as it applied or applies during the first academic year of their enrolment, unless components of the programme are no longer offered. In such cases, students must transfer according to the applicable transitional measures. Deviations require the approval of the Board of Examiners. Before submitting a request to this end, the student must have first obtained recommendations from an academic counsellor.
4. If a course is cancelled in a degree 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.
5. 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.
6. 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.
7. 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.

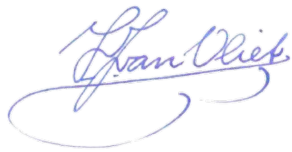
Article 31 – Publication of the regulations

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, 2022 .

Issued by the Dean of the Faculty on 29 August 2022, 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.



Prof.dr.ir. L.J. (Lucas) van Vliet

APPENDIX I. 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 components²²:
 - 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 projects²³ of the programmes are governed by the EEMCS Graduation Policy (MSc)²⁴. This requires that a student obtains a Declaration of Credits Obtained before embarking on the thesis project. In order to obtain a Declaration of Credits Obtained, at least 60 credits of the Master's degree course work as stated in their IEP should be completed.

²² Nomenclature may differ.

²³ 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.

²⁴ More information <https://www.tudelft.nl/en/student/eemcs-student-portal/education/graduation-msc>

3. With regard to the thesis project, the thesis supervisor may impose additional conditions to be met before starting the thesis project.
4. The thesis project and resultant thesis report should comprise original work carried out by the student as part of the master's programme.
5. Students may present and defend their thesis work only after they have finished all courses as stated in their approved Individual Exam Programme (IEP).²⁵

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 course²⁶, 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 result has been earned for all subjects: a mark, a pass (v) or an exemption (vr). 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 or 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

²⁵ 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.

²⁶ 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).

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.

Part 2A Applied Mathematics

Article 7 – General

1. The Master's degree programme in Applied Mathematics has seven specialisations and is described in article 8A:
 - a. Computational Science and Engineering;
 - b. Financial Engineering;
 - c. Discrete Mathematics and Optimization;
 - d. Stochastics;
 - e. Partial Differential Equations;
 - f. Mathematics of Data Science;
 - g. Mathematics of Quantum Technology and Computation.
2. An IEP consists of the following parts:
 - a. Common core courses worth 6 credits;
 - b. Orientation course of 6 EC;
 - c. Specialisation courses worth 48-54 EC, of which
 - a maximum of 12 credits may be spent on non-mathematical specialisation courses
 - d. Non-mathematical electives worth 12 to 18 credits,
 - e. A thesis project worth 42 credits.
3. Students are required to gain experience as a mathematician in interdisciplinary work. This requirement can be satisfied in three ways:
 - Through an internship of 12 or 18 EC as part of the non-mathematics electives.
 - Through a Joint Interdisciplinary Project.
 - Through a graduation project performed in an interdisciplinary setting outside the Delft Institute of Applied Mathematics.

Students that have been admitted through a bridging programme (i.e. with a bachelor degree different from (Applied) Mathematics) or that are following the SEC specialisation are exempt from this requirement.
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 common core consists of two courses:²⁷

<i>Code</i>	<i>Course name</i>	<i>EC</i>
TPM005A	Scientific Writing for Applied Mathematics.	3
WM1028AM	Ethics for Applied Mathematics	3

²⁷ Students who follow the Verdiepingsdeel of SEC may replace the common core and 6 credits of non-mathematics electives in the specialisation part by 12 credits worth of SEC courses.

2. Every specialisation has its own orientation course.

<i>Code</i>	<i>Course name</i>	<i>EC</i>	<i>Compulsory for:</i>
WI4201	Scientific Computing	6	Computational Science and Engineering
WI4227-14	Discrete Optimisation	6	Discrete Mathematics and Optimization
WI4430	Martingales, Brownian Motion	6	Stochastics
WI4635	Linear Algebra and Optimization for Machine Learning	6	Mathematics of Data Science
WI4655	Perturbation and Variational Methods for Partial Differential Equations	6	Partial Differential Equations
WI4675	Introduction to Financial Mathematics	6	Financial Engineering
WI4645	Introduction to Quantum Information and Computing	6	Mathematics of Quantum Technology and Computation

3. The specialisation consists of maximum 48-54 credits worth of compulsory and/or recommended courses as stated in the related lists below, with a maximum of 12 EC of non-mathematics courses. Additionally, students may also use two of the courses mentioned in subsection 2 as specialisation courses. Unlisted courses must be submitted to the Board of Examiners for approval. All courses listed as compulsory specialisation courses can also be chosen as recommended specialisation courses.

Specialisation courses for Computational Science and Engineering

Compulsory specialisation courses (choose 3 out of 4 courses):

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4019-SP	Nonlinear Differential Equations	6
WI4204	Advanced Modeling	6
WI4205	Applied Finite Elements	6
WI4475	Data Assimilation	6

The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4011-17	Computational Fluid Dynamics	6
WI4226	Advanced Systems Theory	6
WI4207	Continuous Optimization (MM-4TU)	6
WI4212	Advanced Numerical Methods	6
WI4450	Special Topics in Computational Science and Engineering	6
WI4209	Systems and Control (MM-4TU, -DISC)	6
WI4221	Control of Discrete-Time Stochastic Systems	6
MM-4TU	Inverse Problems in Imaging	6
IN4049TU	Introduction to High Performance Computing	6
WI4260TU	Scientific Programming for Engineers	3
WI4655	Perturbation and Variational Methods for Partial Differential Equations	6
WI4635	Linear Algebra and Optimization for Machine Learning	6
WI4771TU	Object Oriented Scientific Programming with C++	3

Specialisation courses for Financial Engineering:

Compulsory specialisation courses:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4079	Financial Mathematics	6
WI4154	Computational Finance	6
WI4430	Martingales, Brownian Motion	6
WI4201	Scientific Computing	6

The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4019-SP	Nonlinear Differential Equations	6
WI4230	Time series and Extreme Value Theory	6
WI4052	Risk Analysis	6
WI4156(TU)	Game Theory	6
WI4205	Applied Finite Elements	6
WI4224	Special Topics in Financial Engineering	6
WI4505	Quantative Risk Management	6
WI4614	Stochastic Simulation	6
MM	Nonparametric Statistics	6
WI4425	Financial Markets Theory	6
WI4635	Linear Algebra and Optimization for Machine Learning	6
WI4630	Statistical Learning	6
WI4771TU	Object Oriented Scientific Programming with C++	3

Specialisation courses for Discrete Mathematics and Optimization:

Compulsory specialisation course:

WI4620	Semidefinite Optimization	6
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Compulsory specialisation courses (choose 2 out of 4 courses):

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4410	Advanced Discrete Optimization	6
WI4515	Relaxations and Heuristics	6
WI4670	Extremal Combinatorics	6
WI4635	Linear Algebra and Optimization for Machine Learning	6

The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4207	Continuous Optimization (MM)	6
MM-STAR	Machine Learning Theory	8
MM	Quantum Computing	8
MM	Quantum Information Theory	8
MM-LNMB	Scheduling	6
WI4630	Statistical Learning	6

ET4030	Error Correcting Codes	4
MM	Queuing Theory	6
MM	Algebraic Methods in Combinatorics	8

Specialisation courses for Stochastics:

Compulsory specialisation courses:

WI4455	Statistical Inference	6
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Compulsory specialisation courses (choose 2 out of 6 courses):

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4230	Time series and Extreme Value Theory	6
WI4052	Risk Analysis	6
WI4665	Advanced Topics in Statistics	6
WI4615	Stochastic Calculus	6
WI4465	Advanced Topics in Probability	6
MM	Nonparametric Statistics	6

The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
MM-STAR	Asymptotic statistics	8
WI4050	Uncertainty and Sensitivity Analysis	6
WI4138	Decision Theory/Expert Judgment	6
WI4156(TU)	Game Theory	6
WI4630	Statistical Learning	6
WI4640	High Dimensional Probability	6
WI4614	Stochastic Simulation	6
MM	Stochastic Processes	8
MM	Statistics for Stochastic Processes	8
WI4505	Quantitative Risk Management	6

Specialisation courses for Mathematics of Data Science:

Compulsory specialisation course:

WI4630	Statistical Learning	6
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Compulsory specialisation courses (choose 2 out of 4 courses):

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4203	Applied Functional Analysis	6
WI4640	High Dimensional Probability	6
WI4455	Statistical Inference	6

WI4614	Stochastic Simulation	6
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The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
MM	Machine Learning Theory	8
WI4207	Continuous Optimization (MM)	6
WI4410	Advanced Discrete Optimization	6
WI4645	Introduction to Quantum Information and Computing	6
WI4230	Time Series and Extreme Value Theory	6
CS4230	Machine Learning 2	5
WI4665	Advanced Topics in Statistics	6
WI4620	Semidefinite Optimization	6

Specialisation courses for Partial Differential Equations:

Compulsory specialisation courses (choose 3 out of 6 courses):

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4203	Applied Functional Analysis	6
WI4019-SP	Nonlinear Differential Equations	6
WI4520	Nonlinear Analysis and Partial Differential Equations	6
WI4660	Dynamical Systems and Chaos	6
WI4430	Martingales, Brownian Motion	6
WI4201	Scientific Computing	6

The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4006	Special Functions and Representation Theory	6
WI4480	Internet Seminar on Evolution Equations	9
WI4485	Harmonic Analysis	6
WI4615	Stochastic Calculus	6
WI4046	Spectral Theory of Linear Operators	6
MM	Calculus of Variations	8
WI4204	Advanced Modelling	6
WI4205	Applied Finite Elements (MM)	6
MM	Introduction to Numerical Bifurcation Analysis of ODE's and Maps	8
MM	Mathematical Biology	8
WI4211	Advanced Topics in Analysis	6

Specialisation courses for Mathematics of Quantum Technology and Computation:

Compulsory specialisation courses (choose 2 out of 4 courses):

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4203	Applied Functional Analysis	6
CS4090AM	Quantum Communication and Cryptography	6
WI4620	Semidefinite Optimization	6
WI4006	Special Functions and Representation Theory	6

The following courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
MM	Quantum Computing	8
MM	Quantum Information Theory	8
WI4211	Advanced Topics in Analysis	6
WI4046	Spectral Theory of Linear Operators	6
MM	Operator Algebras	8
MM	Lie Groups	8
WI4650	Applied Quantum Algorithms	6
WI4635	Linear Algebra and Optimization for Machine Learning	6
WI4207	Continuous Optimization (MM)	6
AP3663	Special Topics in Quantum Technology	4

4. The non-mathematics elective space may be used for

- non-mathematics courses that show the role of mathematics in applications and society;
- homology, i.e. courses at bachelor's level required to obtain the necessary prior knowledge for a course at master's level (for students with a bachelor degree different from (applied) mathematics);
- courses of the verdiepingsdeel of SEC ,
- the Joint Interdisciplinary Project (TUD4040) or
- an internship of 12 (WI5012) or 18 (WI5118) credits;

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
WM0375TU	Ethics of Technological Risks	3
WM1301TU	Ethics of Transportation	3
WM1401TU	Ethics of Healthcare Technologies	3
WM1135TU	Advanced English for the University	3
TPM301B	Spoken English for Group Work	2
TPM302B	Advanced Spoken English for Group Work	2
TPM303A	Writing in English for the University	2
TPM304A	Advanced Writing in English for the University	2
TPM305A	Writing a Master's Thesis in English	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.

5. The thesis project is performed under supervision of (at least) one of the research groups at DIAM.

In case an external thesis project is mandatory (for students that do not have the internship or JIP as part of their IEP), the course code is WI5005EXT. The code for students that are free to choose between an external or internal project is WI5005. Students that are exempt from the requirement to gain experience as a mathematician in interdisciplinary work should use the code WI5005 for their thesis project in any case.

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:
 - a. The common core courses;
 - b. An orientation course;
 - c. Compulsory specialisation courses (choose 3 out of 4 courses);
 - d. Recommended specialisation courses

3. The common core courses consist of the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
WI1028AM	Ethics for Applied Mathematics	3
TPM005A	Scientific Writing for Mathematics	3

4. The orientation course is:

<i>Code</i>	<i>Name</i>	<i>EC</i>
WI4201COS SE	Scientific Computing	8

5. The specialisation courses

Choose 3 out of 4:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
WI4204	Advanced Modeling	6
WI4205	Applied Finite Elements	6
WI4475	Data Assimilation	6
WI4019-SP	Nonlinear Differential Equations	6

The following mathematics courses are recommended:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
MM	Inverse Problems in Imaging	8
IN4049TU	Introduction to High Performance Computing	6
WI4011-17	Computational Fluid Dynamics	6
WI4450	Special Topics in Computational Science and Engineering	6
WI4226	Advanced Systems Theory	6
WI4207	Continuous Optimization	6
WI4212	Advanced Numerical Methods	6
WI4209	Systems and Control	6
WI4221	Control of Discrete-Time Stochastic Systems	6
WI4771TU	Object Oriented Scientific Programming	3
WI4635	Linear Algebra and Optimization for Machine Learning	6

WI4260TU	Scientific Programming for Engineers	3
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Other courses will be considered by the Board of Examiners if and when requested.

6. An IEP of students in the programme at Delft University of Technology in their second year consists of:
 - a. Specialisation courses worth at least 18 credits
 - b. A Seminar/Literature Study worth 12 credits (WI5001COSSE)
 - c. The thesis project worth 30 credits (WI5000COSSE)

The specialisation courses from the following list:

<i>Code</i>	<i>Course name</i>	<i>EC</i>
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
WI4209	Systems and Control (MM-4TU, -DISC)	6
WI4635	Linear Algebra and Optimization for Machine Learning	6
WI4221	Control of Discrete-Time Stochastic Systems	6
IN4049TU	Introduction to High Performance Computing	6
WI4260TU	Scientific Programming for Engineers	3
MM	Inverse Problems in Imaging	6
WI4204	Advanced Modeling	6
WI4205	Applied Finite Elements	6
WI4019-SP	Nonlinear Differential Equations	6
WI4771TU	Object Oriented Scientific Programming with C++	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 A– Bridging programmes for research university graduates

- Students having obtained a bachelor's degree in Electrical Engineering, Applied Physics, Nanobiology, Civil Engineering, Applied Earth Sciences, Mechanical Engineering, Marine Technology or Aerospace Engineering from TU Delft (WO) can gain access to the Master's degree programme in Applied Mathematics via a bridging programme.

- The bridging programme for Applied Mathematics contains the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
AM1010	Mathematical Structures	6
AM2090	Real Analysis	6
AM2070	Partial Differential Equations	6
AM2080	Introduction to Statistics	6
AM2020	Optimization	6
	For students BSc EE, AP, NB	
AM2060	Numerical Methods 1	6
	Elective for BSc CT, AES, ME, MT, AE	
	See the list of electives at point 8	

- Students will gain access to the Master's degree programme in Applied Mathematics when they have obtained their WO bachelor 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.
- Students having obtained a bachelor's degree in Econometrics from a Dutch University (WO) can gain access to the Master's degree programme via a bridging programme.
- The bridging programme for Applied Mathematics contains the following courses:

AM1010	Mathematical Structures	6
AM2090	Real Analysis	6
AM2060	Numerical Methods 1	6
WI3150TU	Partial Differential Equations A	3
WI3151TU	Partial Differential Equations B	3
AM2040	Complex Function Theory	6
2nd or 3rd year Elective		6

Electives bridging programme AM	
AM2560	Applied Algebra: Codes
AM2530	Systems Theory
AM2510	Decision Theory
AM2570	Markov Processes
AM2550	Advanced Statistics
AM2520-P	Philosophy of Mathematics
AM2520-H	History of Mathematics
AM3500	Mathematics Seminar
AM3520	Logic
AM3570	Fourier Analysis
AM3590	Topology

AM3550	Graph Theory
AM3560	Advanced Probability
AM3530	Numerical Methods 2
AM3580	Differential Geometry
AM3510	Mathematical Physical Models

6. If the student's prior education overlaps with courses of the bridging programme these courses may be removed from the student's bridging programme.
7. Students will gain access to the Master's degree programme in Applied Mathematics 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 2B Computer Engineering

Article 10A – General

The individual examination programme has a study load of 120 credits and consists of:

1. Common core courses worth 25 credits, including a homologation course worth 5 credits
2. Compulsory integration set courses worth 20 credits²⁸
3. Courses from one of the specialisation lists, worth at least 15 credits,
4. Free elective courses worth 15 credits
5. A thesis project worth 45 credits (ES5000 Final Project).

Article 10B – 4TU character of the Master's degree programme in Computer Engineering

After a student has been formally enrolled in the Master's programme in Computer Engineering at the beginning of the first year, he/she will also obtain a secondary enrolment (neveninschrijving) at the TU/e and UT. To retain a secondary enrolment after the first year as well, the student has to select this option when extending his/her study in Studielink.

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 11 – Programme details

1. The common core courses are:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CESE4000*	Software Fundamentals	5
CESE4005**	Hardware Fundamentals	5
CESE4010	Advanced Computing Systems	5
EE4C11	Systems Engineering	5
CESE4015	Software Systems	5
CESE4020	Effective and Responsible Engineering	5

* Homologation course for students with an Electrical Engineering Bachelor's degree

** Homologation course for students with a Computer Science bachelor's degree

2. Integration sets

<i>Code</i>	<i>Name</i>	<i>EC</i>
<i>ES Integration set</i>		
CESE4025	Real-time Systems	5
CESE4030	Embedded Systems Laboratory	5
<i>CE Integration set</i>		
CESE4035	Computer Arithmetic	5
CESE4040	Processor Design Project	5

3. Courses from one of the specialisation lists, worth at least 15 credits:
Students must select all specialisation courses in consultation with their prospective thesis advisor. All courses should relate to Computer Engineering to the thesis subject. IEPs containing courses that are not part of one of the mentioned lists require specific approval from the board of examiners.

The four specialisation lists:

- A. Computer Architecture

²⁸ Students doing the specialisation Control can opt to take 10 EC of Control specialisation courses instead of the CE Integration set CESE4035, CSES4040.

- B. Software
- C. Networking
- D. Control

A. Computer Architecture with the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CESE4075	Supercomputing for Big Data	5
CS4215	Quantitative Performance Evaluation for Computing Systems	5
CESE4095	System Design with HDLs	5
EE4700	Modeling, Algorithms and Data Structures	5
EE4610	Digital IC Design I	5
CESE4085	Modern Computer Architectures	3
CESE4090	Reconfigurable Computing Design	3
CESE4080	Quantum Computing Architecture and Electronics - Fundamentals and state-of-the-art	4
EE4615	Digital IC Design II	5
EE4695	Hardware Dependability	5
EE4690	Hardware Architectures for Artificial Intelligence	5
ET4351	Digital VLSI Systems on Chip	5
ET4362	High Speed Digital Design for Embedded Systems	5
IN4350	Embedded Computer Architecture 2	5
EE4700	Modelling, Algorithms and Data Structures	5

B. Software with the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CESE4075	Supercomputing for Big Data	5
IN4191	Security and Cryptography	5
CS4375	Artificial Intelligence Techniques	5
CS4200-A	Compiler Construction A	5
IN4344	Advanced Algorithms	5
CS4215	Quantitative Performance Evaluation for Computing Systems	5
IN4049TU	Introduction to High Performance Computing	6
IN4150	Distributed Algorithms	6
IN4315	Software Architecture	5
CS4210-A	Algorithms for Intelligent Decision Making	5
CS4240	Deep Learning	5
CS4205	Evolutionary Algorithms	5
IN4254	Smart Phone Sensing	5
CS4220	Machine Learning 1	5

C. Networking with the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE4C06	Networking	5
CESE4055	Ad-hoc Networks	4
CESE4065	Advanced Practical I.o.T. and Seminar	5
CS4215	Quantitative Performance Evaluation for Computing Systems	6
CESE4045	High-performance data networking	5
ET4358	Fundamentals of Wireless Communications	5

CS4090	Quantum communication and cryptography	5
IN4341	Performance Analysis	5
CESE4050	Measuring and Simulating the Internet	5
CESE4060	Wireless IoT and Local Area Networks	5
CS4430	Network Security	5
EE4630	Telecommunication Network Architectures	5
EE4396	Mobile Networks	5
SC42100	Networked & Distributed Control Systems	5
ET4034	Telecom Business Architectures and Models	5
IN4254	Smart Phone Sensing	5

D. Control with the following courses:

SC42001	Control System Design	3
SC42015	Control Theory	6
SC42056	Optimization in Systems and Control	4
SC42150	Statistical Signal Processing	3
SC42155	Modelling of Dynamical Systems	3
CS4215	Quantitative Performance Evaluation for Computing Systems	5
SC42025	Filtering & Identification	6
SC42061	Nonlinear Systems Theory	4
SC42095	Control Engineering	3
SC42130	Fault Diagnosis and Fault Tolerant Control	4
SC42145	Robust Control	3
SC42045	Control Systems Lab	4
RO47019	Intelligent control systems	4
SC42125	Model Predictive Control	4
SC42100	Networked & Distributed Control Systems	3
SC42075	Modeling and Control of Hybrid Systems	3
SC42110	Dynamic Programming & Stochastic Control	5

4. Free elective courses worth at least 15 credits. The free elective space may be used for additional specialisation courses, a project or internship, language courses or courses from other Master's programmes.

The project and internship list is:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE5010	Internship 10-15 ECTS	10-15
ET4399	Extra Project (max. 15EC)	15
TUD4040	Joint Interdisciplinary Project (JIP)	15
IFEEMCS520200	Interdisciplinary Advanced Artificial Intelligence Project	15

Please note:

Students may choose only one project or internship (10-15 EC) from the list above. 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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
TPM018A	English Grammar for the University	2
TPM302B	Advanced Spoken English for Group Work	2
TPM303A	Intermediate Writing in English for the University	2
TPM304A	Advanced Writing in English for the University	2
TPM305A	Writing a Master's Thesis in English	2
WM1115TU	Dutch Elementary 1	3
WM1116TU	Dutch Elementary 2	3
WM1117TU	Dutch intermediate 1	3
WM1135TU	Advanced English for the University	3

Please note:

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

5. Thesis project

The thesis project ES5000 is worth 45 EC.

Article 12 A – Bridging programmes for professional education graduates

- Students having obtained a 'HBO degree' from a Dutch institute of professional education in Computer, Science and Engineering can gain access to the Master's degree programme via a bridging programme.

- The bridging programme consists of the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
IFEEMCS011100	Calculus for Science 1	3
IFEEMCS011200	Calculus for Science 2	3
CSE1205	Linear Algebra	5
WI1909TH	Differential Equations	3
IFEEMCS010500	Probability and Statistics	5
CSE1300	Reasoning and Logic	5
CSE2420	Digital Systems	5
CSE2310	Algorithm Design	5
EE8002	Literature Study for Electrical Engineering	2
CSE2315	Automata, Languages and Computability	5
CSE1110	Software Quality and Testing	5
Choose:		
EE3D11	Computer Architecture and Organisation	5
CSE2430	Operating Systems	5

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
IFEEMCS011100	Calculus for Science 1	3
IFEEMCS011200	Calculus for Science 2	3
IFEEMCS010400	Linear Algebra	5
WI1909TH	Differential Equations	3
EE2S11	Signals and Systems	5
EE3D11	Computer Architecture and Organisation	5
EE2S21	Systems and Control	5
CSE1100	Object Oriented Programming	5
EE8002	Literature Study for Electrical Engineering	2
IFEEMCS010500	Probability and Statistics	5
EE2S31	Signal Processing	5

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

Article 12 B – Bridging programmes for research university graduates

8. Students having obtained a bachelor's degree from the following bachelor programmes at the TU Delft can gain access to the Master's degree programme via a bridging programme:
- Mechanical Engineering
 - Aerospace Engineering
 - Applied Physics
9. The bridging programme for Computer Science consists of the courses listed below.

The following courses are compulsory:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CSE2420	Digital Systems	5
EE3115TU	Digital Communication Systems	4
EE3125TU	Advanced Electronics for Robotics	5
ET3033TU	Circuit Analyses	3
ET3604LR	Electronic Circuits	3
EE3130	Marsrover project	5
CSE2425	Embedded Software	5

10. If the student's prior education overlaps with courses of the bridging programme these courses may be removed from the student's bridging programme.
11. Students will gain access to the Master's degree programme in Computer Engineering 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 2C Computer Science

Article 13 – General

1. The Master's degree programme in Computer Science has three tracks, *Data Science & Technology*, *Software Technology* and *Artificial Intelligence Technology*, described in detail in article 14A and 14B.
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), Software Technology (ST) and Artificial Intelligence Technology (AIT) *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
 - f) 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 one of the research groups 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. (see also: implementation regulations article 4 sub 1)
4. The IEP should be composed as follows:
 - a. Students of the Data Science & Technology track choose 4 out of 8 common core courses from the related following lists:

Data Science & Technology common core courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CS4065	Multimedia Search and Recommendation	5
CS4035	Cyber data analytics	5
CS4375	Artificial Intelligence Techniques	6
IN4089	Data Visualization	5

IN4252	Web Science & Engineering	5
IN4344	Advanced Algorithms	5
IN4315	Software Architecture	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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
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
IN4344	Advanced Algorithms	5
CS4200-A	Compiler Construction	5
CESE4025	Real-time Systems	5
IN4315	Software Architecture	5
CS4220	Machine Learning 1	5

- c. Students of the Artificial Intelligence Technology track choose 4 out of 9 common core courses from the related following lists:

Artificial Intelligence Technology common core courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CS4220	Machine Learning 1	5
CS4065	Multimedia Search and Recommendation	5
IN4315	Software Architecture	5
CS4375	Artificial Intelligence Techniques	5
CS4210-A	Algorithms for Intelligent Decision Making	5
CS4240	Deep Learning	5
IN4325	Information Retrieval	5
CS4205	Evolutionary Algorithms	5
CS4270	Conversational Agents	5

- d. at least 15 credits worth of courses chosen from the list of Computer Science specialisation courses published in the digital study guide.
- e. the seminar 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.

<i>Code</i>	<i>Name</i>	<i>EC</i>
IN4326	Seminar Web Information Systems	5
CESE4065	Advanced Practical I.o.T. and Seminar	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
CS4290	Seminar Distributed Machine Learning Systems	5
CS4210-B	Intelligent Decision Making Project	5
CS4340	Seminar Probabilistic Programming	5
CS4345	Seminar Formal Methods for Learned Systems	5
IN4306	Literature Survey	10

- f. 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.

<i>Code</i>	<i>Name</i>	<i>EC</i>
TPM018A	English Grammar for the University	2
TPM303A	Intermediate Writing in English for the University	2
TPM304A	Advanced Writing in English for the University	2
TPM305A	Writing a Master's Thesis in English	2
WM1115TU	Dutch Elementary 1	3
WM1116TU	Dutch Elementary 2	3
WM1117TU	Dutch intermediate 1	3
WM1135TU	Advanced English for the University	3

The free elective space may also be used for the Joint Interdisciplinary Project (JIP) or the Interdisciplinary Advanced Artificial Intelligence Project

<i>Code</i>	<i>Name</i>	<i>EC</i>
TUD4040	Joint Interdisciplinary Project (JIP)	15
IFEEMCS520200	Interdisciplinary Advanced Artificial Intelligence Project	15

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

Article 14B – The tracks Data Science & Technology (DST), Software Technology (ST) and Artificial Intelligence Technology (AIT) *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

- a. The common core courses of the selected track:

ST track (choose 5 out of 11)

DST track (choose 4 out of 8) >25EC

AIT track (choose 4 out of 9) >20EC

- b. BI core courses 25EC
- c. BI specialisation courses >15EC
- d. Literature study 10EC
- e. Free electives >10EC
- f. Thesis project 45EC

IEP must be approved by the Bioinformatics Coordinator

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
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

3. Specialization courses: choose at least 15 EC:

<i>Code</i>	<i>Name</i>	<i>EC</i>
Bioinformatics specialization Courses Q1		
CS4070	Multivariate Data Analysis	5
EE4C06	Networking	5
IN4049TU	Introduction to High Performance Computing	6
IN4252	Web Science & Engineering	5
IN4344	Advanced Algorithms	5
CS4375	Artificial Intelligence Techniques	6
IN4307	Medical Visualization	5

Bioinformatics specialization Courses Q2

CS4220	Machine Learning 1	5
IN4089	Data Visualization	6
IN4150	Distributed Algorithms	6

Bioinformatics specialization Courses Q3

CS4240	Deep Learning	5
CS4195	Modeling and Data Analysis in Complex Networks	5
CS4230	Machine Learning 2	5
IN4325	Information Retrieval	5
IN4315	Software Architecture	5

Bioinformatics specialization Courses Q4

CS4205	Evolutionary Algorithms	5
IN4331	Web-scale Data Management	5
CS4290	Seminar Distributed Machine Learning Systems	5
CS4245	Seminar Computer Vision by Deep Learning	5

4. Literature Study (10 EC)

<i>Code</i>	<i>Name</i>	<i>EC</i>
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.

<i>Code</i>	<i>Name</i>	<i>EC</i>
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, the Software Technology and the Artificial Intelligence Technology track.

2. Common Core Courses Cyber Security:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CS4430	Network Security ²⁹	5
IN4191	Security and Cryptography	5
TPM027a	Cyber risk management	5
CS4035	Cyber data analytics	5
CS4150	Systems Security	5

Students have to complete two additional common core courses from their respective tracks.

3. Technical electives: choose at least 3 courses

<i>Code</i>	<i>Name</i>	<i>EC</i>
IN4253ET	"Hacking Lab"-Applied Security Analysis	5
UT201500040	Introduction to Biometrics	5
CS4380	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
CS4280	Language Based Software Security	5
CS4265	Computer and Network Security: Advanced Topics	5
UT202000026	Secure Cloud Computing	5

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
TPM010a	Cyber Crime Science	5
UT201500038	E-Law	5
TPM020A	Economics of Security	5
UT201500041	Cyber Security Management	5
UT191612680	Computer Ethics	5
CS4185	Capstone Cyber Security	5
TPM025a	User-Centred Security	5
TPM030a	Introduction to Cloud as Infrastructure: The effects of the new business of computing on practice	5

5. Required courses for CS graduation:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CS4120	Seminar Cyber Security	5
IN5000	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 special programme coordinator from Cyber Security.

The special programme in Information Architecture

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
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
SEN1622	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 and Artificial Intelligence 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 15 – Bridging programmes

Article 15A – For professional education graduates

1. Students having obtained a relevant bachelor's degree in Computer Science & Engineering (TI) 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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CSE1200	Calculus	5
CSE1205	Linear Algebra	5
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
CSE2510	Machine Learning	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, 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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CSE1300	Reasoning and Logic	5
CSE1110	Software Quality and Testing	5
CSE1500	Web and Database Technology	5

CSE1505	Information and Data Management	5
CSE2315	Automata, Languages and Computability	5
CSE2115	Software Engineering Methods	5
CSE2510	Machine Learning	5

Choose one out of two:

CSE1100	Object-oriented programming	5
CSE2120	Concepts of Programming Languages	5

Choose one out of two:

CSE1305	Algorithms and Data Structures	5
CSE2310	Algorithms Design	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:
 1. Wireless Communication and Sensing (WiCoS)³⁰
 2. Micro Electronics (ME)
 3. Electrical Power Engineering (EPE)
 4. Signals and Systems (S&S)
2. An IEP consists of the following parts, which are described in article 17A.
 - a. The programme main core of 18 credits,
 - b. A track core of three courses,
 - c. 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,
 - d. A thesis project worth 45 credits,
 - e. If the total number of credits under a to d 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.
3. 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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE4C01	Profile Orientation and Academic Skills	3
EE4C11	Systems Engineering	5

and two courses chosen from the following list:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE4C03	Statistical Digital Signal Processing and Modeling	5
EE4C04	Control System Design	5
EE4C05	Electromagnetics	5
EE4C06	Networking	5
CESE4010	Advanced Computing Systems	5
EE4C08	Measurement and Instrumentation	5
EE4C10	Analog Circuit Design Fundamentals	5
EE4C12	Machine Learning for Electrical Engineering Applications	5

2. The track core is specified by the relating track:

For *Wireless Communication and Sensing* select three courses from the following list:

<i>Code</i>	<i>Name</i>	<i>EC</i>
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³⁰ The track Wireless communication and sensing replaces the track Telecommunications and Sensing Systems (TSS). For more details, see the Transitional Regulations, article 25B.

IN4341	Performance Analysis	5
EE4510	Advanced Electromagnetics	5
EE4565	Propagation and Scattering of EM Waves	5
EE4600	RF / Wireless Concepts and Systems	5
ET4358	Fundamentals of Wireless Communications	5
ET4386	Estimation and Detection	5

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
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
CESE4085	Modern Computer Architectures	5
ET4362	High Speed Digital Design for Embedded Systems	5

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE4530	Applied Convex Optimization	5
EE4595	Wavefield Imaging	5
ET4169	Radar I: From Basic Principles to Applications	5
ET4358	Fundamentals of Wireless Communications	5
ET4386	Estimation and Detection	5
EE4740	Data Compression: Entropy and Sparsity Perspectives	5

3. A list of suggested specialisation courses and specialisation profiles for every track is shown in the digital study guide. Those courses as well as additional main core and track core courses are a-priori acceptable for the specialization space in a student's IEP, and students determine their IEP (including the specialization courses) in consultation with the signatories of their IEP (i.e. with the master coordinator and responsible professor). Note that the signatories can decide not to accept certain combinations of courses if there is too much overlap between them. Also note that it is possible to mix

courses from different suggested profiles when it is accepted by the signatories of the IEP. For courses that are NOT listed as suggested specialization courses in the study guide, students can file a motivated request to the Board of Examiners to place such courses in the specialization space of their IEP. The request and motivation must be co-signed by the signatories of the student's IEP.

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.

f. 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 IEP³¹.

<i>Code</i>	<i>Name</i>	<i>EC</i>
ET4399	Extra project	3-15
EE5010	Internship	10-15
TUD4040	Joint Interdisciplinary Project	15
AP3841	Design Project	12

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.

<i>Code</i>	<i>Name</i>	<i>EC</i>
WM1135TU	Advanced English for the University	3
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM1117TU	Dutch intermediate 1	3
TPM301B	Intermediate Spoken English for Group Work	2
TPM302B	Advanced Spoken English for Group Work	2
TPM303A	Writing in English for the University	2
TPM304A	Advanced Writing in English for the university	2
TPM305A	Writing a Master's Thesis in English	2

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

³¹ See part 3, Transitional regulations for possible exceptions for older cohorts.

- 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.
 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 A– 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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
IFEEMCS011100	Calculus for Science 1	3
IFEEMCS011200	Calculus for Science 2	3
IFEEMCS011300	Calculus for Science 3	3
IFEEMCS010400	Linear Algebra	5
WI1909TH	Differentiaalvergelijkingen	3
IFEEMCS010500	Probability and Statistics	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.

Article 18 B– Bridging programmes for research university graduates

5. 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. Mechanical Engineering
- b. Aerospace Engineering
- c. Applied Physics

6. The bridging programme for Computer Science consists of the courses listed below.
The following courses are compulsory:

CSE2420	Digital Systems	5
EE3120TU	Guided and Wireless EM Transfer	5
EE3115TU	Digital Communication Systems	4
EE3125TU	Advanced Electronics for Robotics	5
ET3033TU	Circuit Analysis	3
ET3604LR	Electronic Circuits	3
EE2S11	Signals and Systems	5

7. If the student's prior education overlaps with courses of the bridging programme these courses may be removed from the student's bridging programme.
8. Students will gain access to the Master's degree programme in Electrical Engineering 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 2E Embedded Systems

Article 19A – General

The individual examination programme has a study load of 120 credits and consists of:

1. Common core courses worth 25 credits, including a homologation course worth 5 credits
2. Compulsory integration set courses worth 20 credits³²
3. Courses from one of the specialisation lists, worth at least 15 credits,
4. Free elective courses worth 15 credits
5. A thesis project worth 45 credits (ES5000 Final Project).

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

After a student has been formally enrolled in the Master's programme in Embedded Systems at the beginning of the first year, he/she will also obtain a secondary enrolment (neveninschrijving) at the TU/e and UT. To retain a secondary enrolment after the first year as well, the student has to select this option when extending his/her study in Studielink.

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 common core courses are:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CESE4000*	Software Fundamentals	5
CESE4005**	Hardware Fundamentals	5
CESE4010	Advanced Computing Systems	5
EE4C11	Systems Engineering	5
CESE4015	Software Systems	5
CESE4020	Effective and Responsible Engineering	5

* Homologation course for students with an Electrical Engineering Bachelor's degree

** Homologation course for students with a Computer Science bachelor's degree

2. Integration sets

<i>Code</i>	<i>Name</i>	<i>EC</i>
<i>ES Integration Set</i>		
CESE4025	Real-time Systems	5
CESE4030	Embedded Systems Laboratory	5
<i>CE Integration Set</i>		
CESE4035	Computer Arithmetic	5
CESE4040	Processor Design Project	5

3. Courses from one of the specialisation lists, worth at least 15 credits:

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

³² Students doing the specialisation Control can opt to take 10 EC of Control specialisation courses instead of the CE Integration set CESE4035, CSES4040.

containing courses that are not part of one of the mentioned lists require specific approval from the board of examiners.

The four specialisation lists:

- A. Computer Architecture
- B. Software
- C. Networking
- D. Control

A. Computer Architecture with the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CESE4075	Supercomputing for Big Data	5
CS4215	Quantitative Performance Evaluation for Computing Systems	5
CESE4095	System Design with HDLs	5
EE4610	Digital IC Design I	5
CESE4085	Modern Computer Architectures	3
CESE4090	Reconfigurable Computing Design	3
CESE4080	Quantum Computing Architecture and Electronics - Fundamentals and state-of-the-art	4
EE4615	Digital IC Design II	5
EE4695	Hardware Dependability	5
EE4690	Hardware Architectures for Artificial Intelligence	5
ET4351	Digital VLSI Systems on Chip	5
ET4362	High Speed Digital Design for Embedded Systems	5
IN4350	Embedded Computer Architecture 2	5
EE4700	Modelling, Algorithms and Data Structures	5

B. Software with the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CESE4075	Supercomputing for Big Data	5
IN4191	Security and Cryptography	5
CS4375	Artificial Intelligence Techniques	5
CS4200-A	Compiler Construction A	5
IN4344	Advanced Algorithms	5
CS4215	Quantitative Performance Evaluation for Computing Systems	5
IN4049TU	Introduction to High Performance Computing	6
IN4150	Distributed Algorithms	6
IN4315	Software Architecture	5
CS4210-A	Algorithms for Intelligent Decision Making	5
CS4240	Deep Learning	5
CS4205	Evolutionary Algorithms	5
IN4254	Smart Phone Sensing	5
CS4220	Machine Learning 1	5

C. Networking with the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE4C06	Networking	5
CESE4055	Ad-hoc Networks	4

CESE4065	Advanced Practical I.o.T. and Seminar	5
CS4215	Quantitative Performance Evaluation for Computing Systems	6
CESE4045	High-performance data networking	5
ET4358	Fundamentals of Wireless Communications	5
CS4090	Quantum communication and cryptography	5
IN4341	Performance Analysis	5
CESE4050	Measuring and Simulating the Internet	5
CESE4060	Wireless IoT and Local Area Networks	5
CS4430	Network Security	5
EE4630	Telecommunication Network Architectures	5
EE4396	Mobile Networks	5
SC42100	Networked & Distributed Control Systems	5
ET4034	Telecom Business Architectures and Models	5
IN4254	Smart Phone Sensing	5

D. Control with the following courses:

SC42001	Control System Design	3
SC42015	Control Theory	6
SC42056	Optimization in Systems and Control	4
SC42150	Statistical Signal Processing	3
SC42155	Modelling of Dynamical Systems	3
CS4215	Quantitative Performance Evaluation for Computing Systems	5
SC42025	Filtering & Identification	6
SC42061	Nonlinear Systems Theory	4
SC42095	Control Engineering	3
SC42130	Fault Diagnosis and Fault Tolerant Control	4
SC42145	Robust Control	3
SC42045	Control Systems Lab	4
RO47019	Intelligent control systems	4
SC42125	Model Predictive Control	4
SC42100	Networked & Distributed Control Systems	3
SC42075	Modelling and Control of Hybrid Systems	3
SC42110	Dynamic Programming & Stochastic Control	5

4. Free elective courses worth at least 15 credits. The free elective space may be used for additional specialisation courses, a project or internship, language courses or courses from other Master's programmes.

The project and internship list is:

<i>Code</i>	<i>Name</i>	<i>EC</i>
EE5010	Internship 10-15 ECTS	10-15
ET4399	Extra Project (max. 15EC)	15
TUD4040	Joint Interdisciplinary Project (JIP)	15
IFEEMCS520200	Interdisciplinary Advanced Artificial Intelligence Project	15

Please note:

Students may choose only one project or internship (10-15 EC) from the list above. 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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
TPM018A	English Grammar for the University	2
TPM302B	Advanced Spoken English for Group Work	2
TPM303A	Intermediate Writing in English for the University	2
TPM304A	Advanced Writing in English for the University	2
TPM305A	Writing a Master's Thesis in English	2
WM1115TU	Dutch Elementary 1	3
WM1116TU	Dutch Elementary 2	3
WM1117TU	Dutch intermediate 1	3
WM1135TU	Advanced English for the University	3

Please note:

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

5. Thesis project

The thesis project ES5000 is worth 45 EC.

Article 21 A – Bridging programmes for professional education graduates

- Students having obtained a 'HBO degree' from a Dutch institute of professional education in Computer, Science and Engineering can gain access to the Master's degree programme via a bridging programme.
- The Bridging programme consists of the following courses:

<i>Code</i>	<i>Name</i>	<i>EC</i>
IFEEMCS011100	Calculus for Science 1	3
IFEEMCS011200	Calculus for Science 2	3
CSE1205	Linear Algebra	5
WI1909TH	Differential Equations	3
IFEEMCS010500	Probability and Statistics	5
CSE1300	Reasoning and Logic	5
CSE2420	Digital Systems	5
CSE2310	Algorithm Design	5
EE8002	Literature Study for Electrical Engineering	2
CSE2315	Automata, Languages and Computability	5
CSE1110	Software Quality and Testing	5
Choose:		
EE3D11	Computer Architecture and Organisation	5
CSE2430	Operating Systems	5

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

<i>Code</i>	<i>Name</i>	<i>EC</i>
IFEEMCS011100	Calculus for Science 1	3
IFEEMCS011200	Calculus for Science 2	3
IFEEMCS010400	Linear Algebra	5
WI1909TH	Differential Equations	3
EE2S11	Signals and Systems	5
EE3D11	Computer Architecture and Organisation	5
EE2S21	Systems and Control	5
CSE1100	Object Oriented Programming	5
EE8002	Literature Study for Electrical Engineering	2
IFEEMCS010500	Probability and Statistics	5
EE2S31	Signal Processing	5

5. Student's will gain access to the Master 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.

Article 21 B – Bridging programmes for research university graduates

1. Students having obtained a bachelor degree from the following bachelor programmes of the TU Delft can gain access to the Master's degree programme via a bridging programme:
 - a. Mechanical Engineering
 - b. Aerospace Engineering
 - c. Applied Physics

2. The bridging programme for Embedded Systems consists of the courses listed below:
 1. The following courses are compulsory:

<i>Code</i>	<i>Name</i>	<i>EC</i>
CSE2420	Digital Systems	5
EE3115TU	Digital Communication Systems	4
EE3125TU	Advanced Electronics for Robotics	5
ET3033TU	Circuit Analyses	3
ET3604LR	Electronic Circuits	3
EE3130	Computer Architecture and Organisation	5
EE2S21	Marsrover Project	5
CSE2425	Embedded Software	5

2. If the student's prior education overlaps with courses of the bridging programme these courses may be removed from the student's bridging programme.
3. Students will gain access to the Master's degree programme in Embedded Systems 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 2F Sustainable Energy Technology

Article 22A – General

1. The Master's degree programme in Sustainable Energy Technology consists 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
 - Electric Mobility systems
 - Electric Mobility & 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 programme in Sustainable Energy Technology is a 4TU MSc programme. The programme is offered at TU/e (Eindhoven University of Technology), TUD (Delft University of Technology) and UT (University of Twente). The programmes have similar learning objectives. The programme at each university is different. Each programme has a different Centraal Register Opleidingen Hoger Onderwijs (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:

<i>Code</i>	<i>Name</i>	<i>EC</i>
SET3013	Renewable Energy	4
WM0201SET	Technical Writing	2
SET3060	Energy System Optimization	5
SET3055	Economics and Regulations of Sustainable Energy Systems	4
SET3815-M	Matlab Fundamentals for Electrical Engineers	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						
	Biomass Energy	Power	Economics & Society	Solar Energy	Storage	Wind Energy	Electric Mobility
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		
Electric Mobility Systems		X			X		X
Electric Mobility & Economics		X	X				X

The profile courses are:

<i>Code</i>	<i>Name</i>	<i>EC</i>
Profile 'Biomass Energy'		
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 ³³	4
	or	
EE4536	AC and DC Microgrids ³⁴	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 Energy'		
ET4376	Photovoltaics Basics	4
ET4377	Photovoltaics Technologies ³⁵	4
ET4378	Photovoltaics Systems ³⁶	4
Profile 'Storage'		

³³ Either Electric power systems of the future or AC and DC Microgrids must be chosen.

³⁴ Either Electric power systems of the future or AC and DC Microgrids must be chosen.

³⁵ This course is part of the TU Delft MicroMasters Solar Energy Engineering.

³⁶ This course is part of the TU Delft MicroMasters Solar Energy Engineering.

SET3080	The Necessity of Storage Technology	4
CH3222	Energy Storage in Batteries	4
SET3085	Hydrogen Technology	4

Profile 'Wind Energy'

AE4W02	Introduction to Wind Turbines: Physics and Technology	4
AE4W13	Site conditions for Wind Turbine Design	4
AE4W09	Wind Turbine Design	4

Profile 'Electric Mobility'

ET4117	Electrical Machines and Drives	4
SET3100	Electric Vehicle & Charging Technology	4
ET4291SET	Digital modelling of electric powertrain	4

3. The elective space (15 EC) should be used for one or 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 knowledge of the SET field,
- To deepen knowledge of the SET profile (profile electives, see below),
- To gain entrepreneurship skills (max. 6 credits, see below),
- To further develop language skills (max. 3 credits, see below).

For students who wish to deepen their knowledge of their SET profile, each profile offers profile electives.

Courses that are not on the list mentioned below will be taken into consideration if and when submitted to the Board of Examiners.

General electives

<i>Code</i>	<i>Name</i>	<i>EC</i>
TUD4040	Joint Interdisciplinary Project	15
SET3995	Geothermal Energy and Applications	4
ME45203	Electrochemical Energy Storage 2: Analytical Modelling	4
ME45201	Electrochemical Energy Storage 1: Fundamentals	3
WM0320TU	Ethics and Engineering	3

Language courses

<i>Code</i>	<i>Name</i>	<i>EC</i>
WM1135TU	Advanced English for the University	3
WM1115TU	Dutch Elementary 1	3
WM1116TU	Dutch Elementary 2	3
WM1117TU	Dutch intermediate 1	3
TPM301A	Spoken English for Group Work	2
TPM302A	Advanced Spoken English for Group Work	2
TPM303A	Writing in English for the University	2
TPM304A	Advanced Writing in English for the University	2
TPM305A	Writing a Master's Thesis in English	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 Board of Examiners.

Entrepreneurship

<i>Code</i>	<i>Name</i>	<i>EC</i>
TPM406A	Corporate Entrepreneurship and Startups	6
TPM416A	Turning Technology into Business	6
TPM420A	Ready to startup	6

Please note:

It is not allowed to take the three profile electives of the Economics and Society profile which focus on entrepreneurship on top of 6EC of entrepreneurship courses in your elective space, except if you are graduating in the Economics and Society profile. These courses are marked with an *.

Profile electives courses

<i>Profile</i>	<i>Code</i>	<i>Name</i>	<i>EC</i>
Biomass	AE4262	Combustion for propulsion and power technologies	4
	CH3681A	Reactors and Kinetics	6
	LM3741	Fermentation Technology & Environmental Biotechnology	6
	ME45001	Advanced Heat Transfer	3
	ME45025	Introduction to Multiphase Flow	5
	ME45070	Advanced Reaction & Separation Systems	5
	ME45135	Process Plant Design	5
	ME45155	Modelling of Thermo- & Hydrodynamic Systems	5
	ME45160	Advanced Applied Thermodynamics	5
	ME45165	Equipment for Mass and Heat Transfer	5
Economics & Society	TPM413A*	Idea to Startup – Energy and Sustainability	5
	SEN1211	Agent-Based Modelling	5
	SEN1531	Design of Integrated Energy Systems	5
	TPM023A	Cost-Benefit Analysis: Theory and Applications	4
	TPM001A	Sociotechnology of Future Energy Systems	4
	TPM404B	Technology Entrepreneurship and Internationalization	5
	TPM414A*	Idea to Startup – Deep Tech	5
	TPM411A*	Idea to Startup – IT & AI	5
Power	ET4103	High Voltage Technology	4
	OE44076	Offshore Renewable Energy	6

Solar	EE4585	Semiconductor Device Physics	5
	ET4379	Photovoltaic Lab Course	4
	ME46065	Thin Film Materials	3
	EE4670	PV Materials Processing and Characterization	4
	EE4680	Photovoltaic Modelling	
Storage		Neutrons, X-Rays and Positrons for Studying Microscopic Structures and Dynamics	6
	AP3311		
	CH3531	Functional Ceramics	3
	CH3513	Electrochemistry for Renewable Energy	4
Wind	AE4205	Multidisciplinary Design Optimization for Aerospace Applications	4
	AE4T40	Airborne Wind Energy	3
	OE44120	Offshore Wind Farms Design	4
	AE4202	CFD for Aerospace Engineers	3
	AE4W30	Wind Resource and Wind Farm Yield	4
Electric Mobility	ME41106	Intelligent Vehicles	5
	EE4C04	Control System Design	5
	ME41100	Vehicle Dynamics	4
	ET4116	Power Electronics	4
	ET4121	A.C. Machines	4
	EE4515	Advanced Power Electronics	4

All profile courses can also be chosen as elective courses.

- 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 EEMCS³⁷ and what is stated in article 3 of this appendix.

Article 24 – Bridging Programme

There are no bridging programmes for Sustainable Energy Technology.

³⁷ <https://www.tudelft.nl/en/student/eemcs-student-portal/education/rules-regulations>

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. For older course equivalencies, see [Appendix II: Course Equivalencies \(2021 and older\)](#)

Course no longer on offer			Equivalent course(s) on offer		
Code	Name	EC	Code	Name	EC
EE4C07	Advanced Computing Systems	5	CESE4010	Advanced Computing Systems	5
IN4343	Real-time Systems	5	CESE4025	Real-time Systems	5
CS4140ES	Embedded Systems Laboratory	5	CESE4030	Embedded Systems Laboratory	5
ET4170	Computer Arithmetic	5	CESE4035	Computer Arithmetic	5
ET4171	Processor Design Project	5	CESE4040	Processor Design Project	5
CS4055	High-performance data networking	5	CESE4045	High-performance data networking	5
ET4285	Measuring and Simulating the Internet	5	CESE4050	Measuring and Simulating the Internet	5
ET4388	Ad-hoc Networks	5	CESE4055	Ad-hoc Networks	5
ET4394	Wireless IoT and Local Area Networks	5	CESE4060	Wireless IoT and Local Area Networks	5
IN4398	Advanced Practical I.o.T. and Seminar	5	CESE4065	Advanced Practical I.o.T. and Seminar	5
ET4310	Supercomputing for Big Data	5	CESE4075	Supercomputing for Big Data	5
EE4575	Quantum Computing Architecture and Electronics - Fundamentals and state-of-the-art	5	CESE4080	Quantum Computing Architecture and Electronics - Fundamentals and state-of-the-art	5
ET4074	Modern Computer Architectures	5	CESE4085	Modern Computer Architectures	5
ET4370	Reconfigurable Computing Design	5	CESE4090	Reconfigurable Computing Design	5
ET4272	System Design with HDLs	2	CESE4095	System Design with HDLs	2
UT201500042	Privacy Enhancing technologies	5	CS380	Privacy Enhancing technologies	5

Article 25B – Transitional regulations

1. For MSc Applied Mathematics:

In academic year 2022-2023, students from older cohorts who follow the Analysis specialisation and did not pass courses that will no longer be offered, can use the following replacements:

WI4645 Introduction to Quantum Information and Computing instead of WI4500 Quantum Information Technology

WI4655 Perturbation and Variational Methods for Partial Differential Equations instead of WI4210 Partial Differential Equations and Functional Analysis

2. For MSc Computer Science 2022-2023

- In academic year 2022-2023 CS4200-B Compiler Construction B will no longer be offered. For students who have CS4200-B Compiler Construction B in their IEP, but have not yet successfully completed the course: the validity of the partial grade for the practical part (50% of the final grade) will be extended to the end of academic year 2022-2023. Students can pass the course by taking the resit exam in 2022-2023.
- In academic year 2022-2023 CS4305TU Applied Machine Learning will no longer be offered. For students who have CS4305TU Applied Machine Learning in their IEP, but have not yet successfully completed the course: the validity of the partial grade for group assignments (50% of the final grade) will be extended to the end of academic year 2022-2023. Students can pass the course by taking the resit exam in 2022-2023.
- In academic year 2022-2023 IN4391 Distributed Systems will no longer be offered. For students who have IN4391 Distributed Systems in their IEP, but have not yet successfully completed the course: the validity of the partial grade for practical part (40% of the final grade) will be extended to the end of academic year 2022-2023. Students can pass the course by taking the resit exam in 2022-2023.
- In academic year 2022-2023 IN4010(-12) Artificial Intelligence Techniques (6EC) has been changed to CS4375 Artificial Intelligence Techniques (5EC). For students who have IN4010(-12) Artificial Intelligence Techniques in their IEP, but have not yet successfully completed the course: the validity of the partial grade for the practical assignments (20% of the final grade) will be extended to the end of academic year 2022-2023. Students can pass the course by taken the exam for CS4375. If the student is not successful in completing IN4010(-12) (6EC) in 2022-2023 the student must change their IEP to CS4375 (5EC).

3. For MSc Embedded Systems 2022-2023

- In academic year 2022-2023 IN4390 Quantitative Evaluation of Embedded Systems will no longer be offered. Students of cohort 2021 and older who have IN4390 Quantitative Evaluation of Embedded Systems in their IEP, but have not yet successfully completed the course: the validity of the grade for the practical parts will be extended to the end of academic year 2022-2023. Students can pass the course by taking the resit exams in 2022-2023. Students of cohort 2021 and older who have not successfully completed the practical part of the course or have not yet taken the course, may take CS4215 Quantitative Performance Evaluation for Computing Systems as a replacement course.
- In academic year 2022-2023 IN4387 System Validation will not be offered. For students of cohort 2021 and older who have IN4387 System Validation in their IEP, but have not yet successfully completed the course: the validity of the partial grade for the project part (50% of the final grade) will be extended to the end of academic year 2022-2023. Students can pass the course by taking the resit exam in 2022-2023.

Part 4 Language requirements

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

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

The following candidates are exempted from the English language test requirement:

- Students with a Bachelor's degree from a Dutch university
- Students with a VWO diploma or VWO English certificate
- Students with an HBO (University of Applied Sciences) degree from a degree programme taught entirely in English

- Students who hold the nationality of one of the following countries: USA, UK, Ireland, Australia, New Zealand or Canada

Sufficient competence in the English language can be demonstrated by passing one of the following tests:

- TOEFL iBT (Test of English as a Foreign Language internet-Based Test) with an overall band score of at least 90
- IELTS (academic version) with an overall band score of at least 6.5
- 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.

If a bridging programme needs to be completed before a candidate can be admitted to a Master's programme, the certificate should be obtained before the start of the bridging programme.

Language level for holders of a non-Dutch diploma (d)

Competence in the English language as demonstrated by passing one of the following tests:

- 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
- IELTS (academic version) with an overall band score of at least 6.5 and a minimum score of 6,0 for each section
- Cambridge Assessment English:
 - C1 Advanced (Certificate of Advanced English) with an overall score of 176 and a minimum score of 169 for each section.
 - C2 Proficiency (Certificate of Proficiency in English) with an overall score of 180 and a minimum score of 169 for each section

Certificates more than two years old will not be accepted.

The following candidates are exempted from the English language test requirement:

- Students who hold the nationality of one of the following countries: USA, UK, Ireland, Australia, New Zealand or Canada;
- Students who hold a Bachelor's degree from one of the above countries;

APPENDIX II. Course Equivalencies (2021 and older)

Appendix to Article 25A – Course equivalencies

Course no longer on offer			Equivalent course(s) on offer		
Code	Name	EC	Code	Name	EC
IN4086-14	Data Visualization	6	IN4089	Data Visualization	5
ET4397IN	Network Security	5	CS4430	Network Security	5
EE4560	Information Theory	5	EE4740	Data Compression: Entropy and Sparsity Perspectives	5
IN4301	Advanced Algorithms	5	IN4344	Advanced Algorithms	5

ET4076-11	VLSI Test Technology & Reliability	5		EE4695	Hardware Dependability	5
EE4660	Hardware Attacks and Design for Security	5		EE4695	Hardware Dependability	5
IN4182	Digital Audio and Speech Processing	6		EE4182	Digital Audio and Speech Processing	6
IN4301	Advanced Algorithms	5		IN4344	Advanced Algorithms	5
WM0506TU	Ready to startup	6		TPM420	Ready to startup	6
WM0516TU	Turning technology into business	6		TPM416A	Turning technology into business	6
WM0638SET	Sustainable Business Venturing	4		TPM403SET	Technology Entrepreneurship and Sustainability	4
WM0903TU	Technology Entrepreneurship and Global Development	4		TPM404A	Technology Entrepreneurship and Global Development	4
EWI4020	Joint Interdisciplinary Project	15		TUD4040	Joint Interdisciplinary Project	15
CH3253SET	Thermochemistry of Biomass Conversion	4		SET3070	Thermochemistry of Biomass Conversion	4
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
MOT9610	Entrepreneurship Basic course	5		TMP401	Technology, Entrepreneurship and Innovation	5

WM0638	Sustainable Business Venturing	4		TPM403	Technology, Entrepreneurship and Sustainability	4
WM0903	Techno., Ent. Global Development	4		TPM404	Technology, Entrepreneurship and Global Development	4
MOT9556	Corporate Entrepreneurship	6		TPM406	Corporate Entrepreneurship and Startups	6
MOT9612	Business Development Lab	5		TPM411	Idea to Startup – IT & AI	5
MOT9515	CleanTech Business Study	5		TPM413	Idea to Startup – Energy & Sustainability	5
?		5		TPM414	Idea to Startup – Deep Tech	5
WM0516	Turning Technology into Business	6		TPM416	Turning technology into business	6
WM0506	Ready to Startup	6		TPM420	Ready to startup	6
WM4002	Experience Entrepreneurship	3		TPM425	Experience Entrepreneurship	3
WM4019	The Journey	6		TPM424	The Journey	6
WM0787	Patent Law and Patent Policy	5		TPM405	Patent Law and Patent Policy	5
MOT9615	Health Business Development Lab	5		TPM412	Idea to Startup – Health & Life Sciences	5
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 Engineering	5
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		CS4140ES	Embedded Systems Laboratory	5
IN4342	Embedded Systems Laboratory	5		CS4140ES	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
WI4520	Nonlinear Analysis and Partial Differential Equations	6		WI4520	Mathematics of Fluid Dynamics	6

APPENDIX III. Transitional Regulations (2021 and older)

Appendix to Article 25 B.- Transitional Regulations.

1. For MSc Computer Science 2019-2020

- **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.

4. For the joint master's programme in Computer Simulations for Science and Engineering (COSSE):

In academic year 2021-2022, COSSE students are allowed to follow either the new 2021-2022 curriculum or the old 2020-2021 curriculum.

5. For MSc SET

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.