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

2017-2018

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

Important changes TER MSc 2017-2018

For this year, no major changes have been implemented regarding the model of the Teaching and Examination Regulations. Several terms have been clarified. As to content, the most important changes are mentioned below.

Article 6, bridging programme

Artikel 6, sub 2 is clarified. Deviation from the registration period of a bridging programme is only possible in exceptional cases. The student has to motivate and provide proof of serious circumstances, that justify an extension of the study duration for a maximum of one year.

Article 10a Evaluation of the study programme

As of January 1 2017, the manner in which the education of a study programme is evaluated needs to be mentioned in the TER (stipulated by law). The evaluation methods usually are formulated in detail in the quality handbook of the faculty or in the implementation regulations. For EEMCS these are formulated in the quality handbook of the faculty.

Article 11a Honours Programme

The Honours Programme MSc comprises of at least 20 EC. As an exception, the Honours Programme may comprise of several EC more, in which case motivation must be provided.

Article 17 Validity of examinations

This article has been updated in response to implemented legal changes.

Article 20 Determining and announcing the results

The formulation is conform the practice of registration and announcement of results by the examiner in Osiris.

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Part 1 General

Article 1 – Areas to which the regulations apply

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

Article 2 – Definitions of terms used

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

The following terms are to be defined as follows:

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

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

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

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

e. teaching period: period of 10 weeks as stipulated in the academic calendar;

f. course: a teaching unit within the programme as intended in Article 7.3, subsection 2 and 3 of the Act;

g. practical: a practical exercise as a subject or as part of a subject, as intended in Article 7.13, subsection 2, paragraph d of the Act, taking one of the following forms:
- writing a thesis or paper;
- conducting a project or experimental design;
- completing a design or research assignment;
- completing a project
- conducting a literature review;
- completing an internship;
- participating in fieldwork or an excursion;
- conducting tests and experiments;
- participating in other educational activities aimed at enabling participants to attain certain skills;

h. examination: an assessment of the knowledge, insight and skills of a student in relation to a course, e.g. a written test or a practical, as well as the marking of that assessment by at least one examiner, appointed for that purpose by the Board of Examiners;

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

j. degree audit: an assessment by which the Board of Examiners, in accordance with Article 7.10 of the Act, establishes whether all examinations in the various courses that constitute the programme have been successfully completed;

k. Board of Examiners:	the programme's Board of Examiners, which has been installed in accordance with Article 7.12 of the Act;
l. examiner:	the individual who, in line with Article 7.12, subsection 3 of the Act, has been appointed to set the examinations;
m. Implementation Regulations:	the Implementation Regulations which form part of these Teaching and Examination Regulations;
n. credit/EC:	a credit or European credit (EC) awarded in line with the European Credit Transfer System (ECTS); one credit denotes a study load of 28 hours;
o. working day:	Monday to Friday with the exception of recognised national public holidays;
p. study guide:	the digital guide to the programme containing specific information pertaining to the various subjects;
q. institute:	Delft University of Technology;
r. electronic learning environment:	an electronic system designed for the exchange of teaching information e.g. BlackBoard, Brightspace, Osiris;
s. student registry system:	an electronic system designed for the registration of study progress, e.g. Osiris
t. disability:	all conditions which are (at least for the specified period) chronic or lasting in nature and which form a structural limitation for the student in receiving education and/or sitting examinations or taking part in practicals;
u. IEP:	Individual exam programme
v. academic year:	the period from 1 September till 31 August of the following calender year;
w. bridging programme:	a deficiency programme aimed at moving up to a Master's degree programme, while enrolled in a Bachelor's degree programme, but without obtaining a Bachelor's degree;
x. programme duration:	the duration starting from the enrolment of the student till the last examination.

Article 3A – Objective of the Master's programme in Applied Mathematics

This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Applied Mathematics, as laid down in 4A, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

Article 3B – Objective of the Master's programme in Computer Engineering

This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Computer Engineering, as laid down in 4B, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

Article 3C – Objective of the Master's programme in Computer Science

This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Computer Science, as laid down in 4C, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

Article 3D – Objective of the Master's programme in Electrical Engineering

This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Electrical Engineering, as laid down in 4D, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

Article 3E – Objective of the Master's programme in Embedded Systems

This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Embedded Systems, as laid down in 4E, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

Article 3F – Objective of the Master's programme in Sustainable Energy Technology

This Master's programme is intended to impart sufficient knowledge, skills and a clear understanding of the area of Sustainable Energy Technology, as laid down in 4F, in order that the graduate is able to perform independent professional and scientific activities in the area at an academic level.

Article 4A – Exit qualifications of the Master's programme in Applied Mathematics

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

Article 4B – Exit qualifications of the Master's programme in Computer Engineering

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

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

7. *Context.* The graduate understands the professional, societal and ethical context in which engineering is practiced, as well as the effects of engineering projects on society. He or she can take part in debates related to these contexts.

Article 4C – Exit qualifications of the Master's programme in Computer Science

Graduates

1. have general knowledge of computer science and the relevant issues of mathematics and computer engineering.
2. have in-depth knowledge in either Software Technology or in Data Science and Technology and have demonstrated the ability to apply it through a Master's thesis project.
3. 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.
4. know how to work individually or in teams.
5. are able to analyse and conceptualise at a formal and abstract level.
6. understand the fundamental issues of this field and contribute to research and the further development of the field.
7. position their contributions within the wider scope of the overall development of science and technology, as well as within industry and society.
8. 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 4D – Exit qualifications of the Master's programme in Electrical Engineering

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 4E – Exit qualifications of the Master's programme in Embedded Systems

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

Article 4F - Exit qualifications of the Master's programme in Sustainable Energy Technology

Graduates of the Master's programme in Sustainable Energy Technology

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

In addition, they

1. have mastered Sustainable Energy Technology at an advanced academic level. This means mastery of at least three advanced general subjects (such as Solar Energy, Wind Energy, Biomass Energy, Energy Storage, Sustainable Electrical Power Engineering, Energy and Societal topics) and the necessary skills in the field of experimental techniques, theoretical analysis,

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

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

Article 5 – Admission to the programme

1. All students possessing a certificate from Delft University of Technology, Eindhoven University of Technology or University of Twente proving that they have successfully completed their Bachelor of Science studies[2]
   a. in Applied Mathematics (Technische Wiskunde) will be admitted to the Master's programme in Applied Mathematics,
   b. in Electrical Engineering or Computer Science (Technische Informatica) will be admitted to the Master's programme in Computer Engineering,
   c. in Computer Science (Technische Informatica) will be admitted to the Master's programme in Computer Science,
   d. in Electrical Engineering will be admitted to the Master's programme in Electrical Engineering,
   e. in Electrical Engineering or Computer Science (Technische Informatica) will be admitted to the Master's programme in Embedded Systems.
   f. in Aerospace Engineering, Applied Earth Sciences, Applied Physics (Technische Natuurkunde), Chemical Engineering (Scheikundige Technologie), Electrical Engineering, Molecular Science & Technology or Mechanical Engineering (Werktuigbouwkunde) will be admitted to the Master's programme in Sustainable Energy Technology.
2. Students who do not possess the degree mentioned in subsection 1 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.
3. In order to obtain proof of admission, the student must meet or, as the case may be, possess:
   a. the general relevant criteria set by the executive board in the "Policy on fees and enrolment", laid down in Appendix 1 of the Student Charter (central part), and clarified in Part 1.2 " Entrance and admission" of the mentioned Student Charter,
   b. a certificate, together with the accompanying list of marks, proving that he/she possesses knowledge of a sufficiently high level and broad scope to successfully complete the programme within the allotted period.
4. Students with a foreign Bachelor's degree certificate may only be admitted to the programme if they have a Grade Point Average of at least 75% of the maximum points available, unless specific requirements for the country in which the student obtained his or her bachelor's degree have been established.
5. For admission to special programmes or tracks, such as AM-COSSE or EIT-DMT other requirements may have to be met.

[2] see www.doorstroommatrix.nl for additional information

6. Students in the possession of a certificate of admission for the Master's programme Sustainable Energy Technology of TU/e and UT, are automatically accepted in the master's programme SET-Delft, since admission criteria are the same for the 3TU Master's programmes (see also appendix 1 of the Implementation Regulations of the Masters' degree programme SET – Delft).

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 subsection 1 of this article, his enrolment is terminated. Under exceptional personal circumstances the student can submit a well-founded request for an extension of the course duration for a period of at most twelve months.
3. The Executive Board will set the fee to be charged, as denoted in Article 7.57i of the Act, for the enrolment as student in a bridging programme and for the extension thereof, as denoted in subsection 2 of this article.

Article 7

Not applicable.

Article 8 – Full-time and part-time programme formats

All programmes are taught only on a full-time basis.

Article 9 – Language

1. Courses are taught in English and examinations and final examinations take place in English.
2. Notwithstanding the provisions of subsection 1, the dean can give permission for classes to be taught in Dutch if the particular nature of the subject, the organisation, the quality of the education or the origin of the students gives cause for this.
3. Should a student request permission to complete one or more parts of the examination or the final examination in a language other than English, this will be subject to the stipulations of the Board of Examiners in this regard, as laid down in the Rules and Guidelines of the Board of Examiners.

Part 2 Composition of the degree programme and the degree audit

Article 10 – Composition of the degree programme and the degree audit

1. The composition of the degree programme and the relevant transitional regulations are laid down in the Implementation Regulations.
2. The degree audit forms part of the programme. The programme has a total study load of 120 credits.
3. It is not permitted for any course in the exam programme to have been part of the Bachelor's degree programme on the basis of which the student was admitted to the programme. If a course in the exam programme was already completed in the aforementioned Bachelor's degree programme, the Board of Examiners will designate an alternative course in its place.

Article 10A – Evaluation of the study programme

The way in which the teaching in the study programme is evaluated is laid down in a separate document that is presented to the Faculty Student Council and the Board of Studies.

Part 3 Honours Programme and other annotations

Article 11A - Honours Programme

1. Students who meet the following criteria will be invited to register for the Delft University of Technology Honours programme for outstanding Master's students (HPM):
   a. Students who have finished their bachelor programme with a weighted averaged mark of 7.5 or higher and
   b. Have shown an excellent performance during the first semester (no fails and 7.5 or higher).
2. Based on the above criteria, 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. The HPM will comprise at least 20 credits:
   a. At least 5 credits must be completed in the Delft University of Technology-wide component of the HPM, which consists of:
      - the subject WM055HT Critical Reflection on Technology
      - playing an active role within the HPM community
   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.
4. Any student selected for participation in the HPM must submit his or her options for the faculty component to the Board of Examiners and the director of studies or the HPM coordinator or the HPM committee for approval.
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 11B - Technology in sustainable development annotation[3]

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

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

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

Article 11C - Entrepreneurship annotation[4]

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

1. Obligatory Entrepreneurship Modules (10 credits),
2. Entrepreneurship electives (20 credits)

The programme should be approved by the coordinator.

[3] Not for students in the Master's programme in Sustainable Energy Technology.
[4] For students in the Master's programme in Computer Engineering, Computer Science, Electrical Engineering, Systems and Sustainable Energy Technology.

Article 11D - Flexible exam programme

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

Part 4 Registering and withdrawing

Article 12 - Registering for written examinations

1. Registration to take part in a written examination is done by entering the required data into Osiris no later than 14 calendar days (not *working* days) before the examination.
2. Students may submit a request to register for an examination after the deadline mentioned in subsection 1 has passed but no later than 3 calendar days before the examination in question, in Osiris. 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 a confirmation: the exam ticket in the form of an email.
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. The following applies upon entering the examination room:

   a. students will only be admitted to the examination with valid proof of identity. The following will be accepted as proof of identity: campus card, passport, identity card or driving licence.

   and

   b. students will only be admitted to the examination with a valid examination ticket or if they are included in the list of participants.
5. A student who has not registered for the examination and is therefore not included on the list of participants, may report to the invigilator on the day of the examination from 15 minutes before until the start of the examination. In so far that there are seats available, they will be admitted to the examination room half an hour after the start of the examination in the order they reported to the invigilator. The lack of half an hour 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 exam subject to the reservation that it will be investigated whether he/she is entitled to participate in the examination.
6. In case the investigation leads to the conclusion that the student was not entitled to participate in the examination, the examination work is invalid, will not be evaluated and does not lead to a result.
7. The student can submit a substantiated request to the Board of Examiners to have examination work that is considered to be invalid to be declared valid and to have it evaluated.
8. The Board of Examiners will only agree to the request in exceptional circumstances.

Article 13 - Registering for practicals

1. Registration for practicals will take place in the manner and by the deadline indicated in the study guide, on Bright Space or in the Implementation Regulations of the TER for the practical in question.
2. In special cases the Board of Examiners may deviate from the period of registration referred to in subsection 1, however only in favour of the student.
3. Students who do not register for a practical on time may not participate in that practical. In exceptional circumstances the Board of Examiners may allow the student to participate in the practical.
4. If a student participates in a practical for which the student was not properly registered, the Board of Examiners can declare the results of the practical to be invalid.

Article 14 - Withdrawal or absence

1. It will be possible to withdraw from an examination via the student registry system up to 3 working days before the examination takes place.
2. Any student who has withdrawn from an examination should re-register on a subsequent occasion, in accordance with the provisions of Article 12.

Part 5 Examinations

Article 15 – Number and times of examinations

1. There are two opportunities in each academic year for written examinations:
   - the first opportunity is immediately after the teaching period for the course to which the examination in question relates,
   - the second opportunity is at the end of the subsequent teaching period, or else during the resit period in July or August during the same academic year.
2. The frequency of examinations is laid down in the Implementation Regulations. A timetable of all the opportunities to sit written examinations is drawn up on an annual basis and distributed before the start of each semester.
3. If absolutely necessary, changes can be made to this examinations' timetable but only with the approval of the Board of Examiners and if the changes are communicated to students through the official means of communication (the electronic learning environment) at least 4 weeks in advance. In case of force majeure, deviation from this period is allowed, only by decision of the Board of Examiners.
4. If an examination is part of a course not offered by the faculty of EEMCS the relevant stipulations in the Teaching and Examination Regulations of the relevant programme will apply. The Board of Examiners reserves the right to make decisions that deviate from the norm regarding this matter.
5. Notwithstanding the provisions of subsection 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 16 – Sequence of examinations

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

Article 17 – Validity of examinations

1. The result of a final grade[5] is valid for an unlimited period.
2. The Board of Examiners may only limit the validity of a successful examination result if the examined knowledge is demonstrably outdated, or if the examined skills are demonstrable outdated.
3. In an individual case the Board of Examiners may deviate from that laid down in subsection 2 and decide that the validity of the examination result may be extended.
4. The terms of subsection 1 likewise apply to component examinations, including practicals, unless the validity of the component examination is linked to a period of time in the study guide.

Article 18 – The form of examination and method of assessment

1. The examinations are set as described in the study guide. Practical skills are tested during the hours allocated for practical training.

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

2. The form of the examinations is specified in the study guide before the start of the concerned semester.
3. If there is no indication as to the way an examination is to be set because it relates to a course not taught by the programme itself, the relevant stipulations in the study guide of the relevant programme will apply.
4. The Board of Examiners may deviate from the provisions of subsections 1 and 2, in favour of the student.

Article 19 – Oral examinations

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

Article 20 – Determining and announcing the results

1. The examiner is required to determine and publish the result of an oral examination within 48 hours after the moment it is finished.
2. In the case of written examinations, the examiner is required to determine the result as soon as possible after the examination 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. If the examiner is not able to meet these requirements due to exceptional circumstances, he or she must inform the Board of Examiners, stating the reasons for the delay and informs the students as soon as possible.
3. In case of practicals, 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 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. If the examiner is not able to meet these requirements due to exceptional circumstances, he or she must inform the Board of Examiners, stating the reasons for the delay and informs the students as soon as possible.
4. Regarding any examinations that are not taken orally, in writing or as a practical, the Board of Examiners shall determine beforehand precisely how and within which period of time the student will be notified of the results.
5. 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 21, as well as the opportunity to lodge an appeal with the Examination Appeals Board.

Article 21 – The right to inspect the results

1. For a period of at least 20 working days after notification of the results of any written examination, the student has the right to inspect his or her marked work. On request students will be supplied with a copy of the marked work.
2. During the period referred to in subsection 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 Board of Examiners may determine that the right to inspection or perusal referred to in subsections 1 and 2 will take place at a location specified beforehand and at a time also specified beforehand. 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 subsection 1. The location and times mentioned in the first sentence will be announced well in advance.

Article 22 – Discussing the examination results

1. 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.
2. 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.
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 subsection, 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 provisions of subsection 3 are similarly applicable if either the Board of Examiners or the examiner first gives the student the opportunity to compare his/her answers with model answers.
5. The Board of Examiners may permit departures from the provisions of subsections 2 and 3.

Part 6 Studying with a disability

Article 23 – Adaptations to help students with a disability

1. Students who have a physical or sensory disability are entitled to adaptations in teaching, examinations and practicals, 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 practicals to the student's individual situation or making practical aids available.
2. The application referred to in the preceding paragraph 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 subsection 1 should be accompanied by a recent medical certificate from a doctor or a psychologist. If there is evidence of dyslexia, the request should be accompanied by a document issued by a recognised dyslexia-testing bureau (i.e. registered with BIG, NIP, or NVO). If possible, this certificate should also estimate the extent to which the disability forms an obstacle to study progress.
4. Requests for the adaptation of teaching facilities will be decided upon by the dean or by the director of studies acting on the dean's behalf. The Board of Examiners will decide on requests for adaptations to examinations.

Part 7 Exemptions

Article 24 – Exemption from examinations or practicals

1. After having been advised by the relevant examiner, the Board of Examiners may decide to exempt students from an examination or practical 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 or practical completed within the Dutch higher education system or elsewhere which, as regards content and study load, corresponds with the examination or practical for which exemption is sought, or
   c. proof of knowledge and/or skills acquired outside the higher education system.
2. If the relevant examiner has made a fully motivated proposal to this effect, the Board of Examiners may grant exemption from an examination.

5. Students with an approved IEP may complete this programme, in so far as courses are available. In the case where courses are no longer available, they may be substituted by existing courses according to the relevant course equivalencies as stated in the appendix (part 3). However, the total number of EC of the IEP must be at least 120 EC. Any change in the IEP that is not covered by the course equivalencies in part 3 of the appendix needs the approval of the Board of Examiners.
6. If it is no longer possible to complete an exam programme, students must submit a new IEP according to the exam programme described in the current implementation regulations.

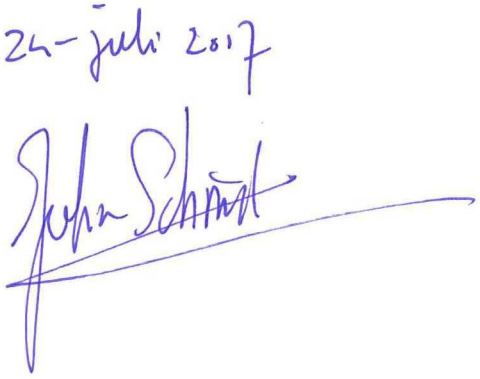
Article 32 – Publication of the regulations

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 33 – Entry into force

These Regulations and their appendix will come into effect on 1 September 2017.

Issued by the dean of the Faculty on July 24, 2017, after the approval of the Faculty Student Council and consideration of the recommendations by 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 on June 29, 2017.



Part 8 Degree Audit

Article 25 – The times and frequency of and the admission to the degree audit

1. At least nine times a year there is an opportunity to take the Master's degree audit. 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 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 9 Study progress checks and reporting

Article 26

Not applicable

Article 27

Not applicable

Article 28– Study progress checks

The student administration shall ensure that each student is able to see and check his/her own results via the electronic learning environment (Osiris). A certified list of results can be obtained at the Servicepoint of the faculty.

Part 10 Contravention, changes and implementation

Article 29 – 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 30 – Changes to the regulations

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

Article 31 – Transitional regulations

1. If the composition of the exam programme undergoes intrinsic changes or if these regulations are amended, the dean will draw up transitional regulations that will be incorporated into the Implementation Regulations.
2. Such transitional regulations are required to include:
   a. a provision concerning the exemptions that can be given on the basis of examinations already passed;
   b. a provision specifying the period of validity of the transitional regulations.
3. If a course is removed from the exam programme, e.g. due to a new programme, four opportunities to sit an examination in this course will be granted after the last classes have been taught: an examination in the last teaching period of the course, a resit in the same academic year, and two resits in the subsequent academic year.
4. If a new exam programme is drawn up for a certain year of study, students that started before that year may change their IEP with the understanding that they include either all compulsory parts of the old programme or all compulsory parts of the new programme. Any change in the IEP needs the approval of the Board of Examiners.

Appendix: Implementation Regulations

Part 1 General

Article 1 - Study load and duration

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

Article 2 - Programme structure

1. Each Master's degree programme comprises the following components[6]:
   a. The Master Kick-Off, which provides an introduction to the Master's programme and prepares students to work in a multicultural environment. The Master Kick-off is a compulsory event comprising of social activities, lectures, an interdisciplinary project and a workshop on cultural differences.
   b. 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.
   c. 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.
   d. A thesis project that serves as final assessment of the student (ref. article 3).
2. Each semester the dean issues lists of all courses offered to the students of the faculty. The lists with these courses are published in the study guide.

Article 3 - The thesis project

1. The thesis project is the last study unit of the programme and serves to prove that the student has acquired the academic competencies of a Master of Science. The project involves a research or design task with sufficient academic level. The project may be executed within a research programme at Delft University of Technology, or in a suitable research institute or company. The project must be executed with a systematic approach and should include all phases of a research or design project: problem formulation, analysis, modelling, implementation/construction and validation/evaluation. The student executes the thesis project independently, with guidance of one or more thesis supervisors, at least one of them from the scientific staff of Delft University of Technology.
2. The thesis projects[7] of the programmes are governed by the EEMCS Graduation Policy (MSc). This requires that a student obtains a Thesis Entrance Permit (TEP) before embarking on the thesis project. In order to obtain a TEP, at least 60 credits of the Master's degree course work as stated in their IEP should be completed.
3. The thesis project of the programme in Sustainable Energy Technology is also governed by the EEMCS Graduation Policy (MSc), but differs for students from cohorts before 2017-2018: these students may start the Master thesis project after completion of 45 EC of theoretical courses. This means that the industrial internship and the projects ET4380SET and SET3811 are excluded.
4. 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.

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

5. Students may present and defend their thesis work only after they have finished all courses as stated in their approved IEP.[8]

Article 4 - Individual exam programme (IEP)

1. Students draw up their IEP according to the programme structure described in article 2 and the stipulations of the relevant programme, in consultation with the Master coordinator and the IEP reviewer appointed by the head of the EEMCS research group where the student plans to perform his or her thesis project.
2. Students must submit their IEP for approval by the Board of Examiners before the start of the fourth quarter of the first year.
3. If the contents of a compulsory course correspond to a large degree to the course contents of one or more courses followed in a prior exam programme, a student can apply for exemption from the compulsory course. It must be replaced by a specialisation course, 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.

Article 5 - Examination requirements

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

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

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

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

[8] 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.

Part 2A Applied Mathematics

Article 6 - General

1. The Master's Degree Programme in Applied Mathematics has five specialisations and is described in article 7A:
   a. Analysis (An),
   b. Computational Science and Engineering (CSE),
   c. Financial Engineering (FE),
   d. Optimisation (Opt).
   e. Stochatistics (Sto),

2. An IEP consists of the following parts:
   a. Core courses worth 24 credits,
   b. A specialisation worth at least 36 credits, of which
      - a maximum of 6 credits may be spent on non-mathematical courses and
      - at least 6 credits must be spent on *MasterMath* (MM) courses.
   c. Non-mathematical electives worth 12 to 18 credits,
   d. A thesis project worth 42 credits.
3. During their education students are required to gain experience as a mathematician outside the institute. For students who perform their thesis project at the Delft Institute of Applied Mathematics this requirement must be fulfilled through a compulsory internship of 12 or 18 credits as part of the non-mathematical electives.
4. The joint Master's Programme in Computer Simulations for Science and Engineering (COSSE) deviates and is described in article 7B.
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 7 - Programme details

Article 7A - Applied Mathematics

1. The core consists of two parts, the general part (6 credits)[9] and the mathematics part (18 credits).

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

Code	*Course name*	*EC*
WM0935TU	Mathematical modelling and society.	3
WM1028AM	Ethics for Applied Mathematics	3
EWI4000	Master Kick-off	0

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

Code	*Course name*	*EC*	*Compulsory for:*
WI4201	Scientific Computing	6	Computational Science and Engineering, Financial Engineering
WI4203	Applied Functional Analysis	6	Analysis
WI4227-14	Discrete Optimisation	6	Optimisation
WI4430	Martingales, Brownian Motion and Stochastic Calculus	6	Financial Engineering, Stochastics
W4455	Statistical Inference	6	Stochastics

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

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

Specialisation courses for Analysis

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

Code	*Course name*	*EC*
WI4006	Special Functions[10]	6
WI4046	Spectral Theory of Linear Operators[11]	6
WI4210	PDE and Functional Analysis	6
WI4211	Advanced Topics in Analysis	6
WI4415	Approximation Theory[12]	6
WIxxx	Harmonic analysis[13]	6
WIxxx	Quantum Information Theory	6
WIxxx	Internet Seminar on Evolution Equations	9
WI4129	Stochastic Differential Equations (MM-4TU)	6
(MM)	Variational Methods	8
(MM-GQT)	Lie Groups and Lie Algebras	8
(MM-GQT)	Hypergeometric Functions	8
(MM-GQT)	Differential Geometry	8
(MM)	Operator Algebras	8
(MM-Wonder)	Hamiltonian Dynamics	8
(Leiden)	Introduction to manifolds	6

Specialisation courses for Computational Science and Engineering

Compulsory for all students in the specialisation:

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

The following mathematics courses are recommended:

Code	*Course name*	*EC*
WI4011	Computational Fluid Dynamics	6
WI4475	Data Assimilation	6
WI4226	Advanced Systems Theory	6
WI4212	Advanced Numerical Methods	6
WI4450	Special Topics in Computational Science and Engineering	6
WI4055	Computational aspects of stochastic differential equations	6
WI4231	Mathematical Data Science	6
WIxxxx	Perturbation Methods	6
WI4209	Systems and Control (MM-4TU, -DISC)	6
WI4420	Continuum Mechanics[14] (MM-4TU, NDNS+)	8

[10] Offered only in even years.
[11] Offered only in even years.
[12] Offered in uneven years.
[13] Offered only in uneven years.
[14] Offered only in uneven years.

The following non-mathematics courses are recommended:

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

Specialisation courses for Financial Engineering:

Compulsory for all students:

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

The following mathematics courses are recommended:

Code	*Course name*	*EC*
WI4019	Nonlinear Differential Equations	6
WI4055	Computational aspects of stochastic differential equations	6
WI4231	Mathematical Data Science	6
WI4230	Time series and Extreme Value Theory	6
WI4052	Risk Analysis	6
WI4156(TU)	Game Theory	6
WI4205	Applied Finite Elements (MM-4TU)	6
WI4224	Special Topics in Financial Engineering	6
WI4228	Credit Risk Modelling	6
WI4614	Stochastic Simulation	6
WI4435	Nonparametric Statistics [15]	6
MM	MasterMath Applied Statistics TUD version[16]	6
MM	MasterMath Applied Statistics TU/e version	6
MM	MasterMath Applied Statistics UT version	6

Specialisation courses for Optimisation:

Compulsory for all students in the specialisation:

Code	*Course name*	*EC*
WI4410	Advanced Discrete Optimization	6
WI4207	Continuous Optimization (MM-LNMB/4TU)	6
WI4490	Convex analysis and optimisation	6

The following mathematics courses are recommended:

Code	*Course name*	*EC*
MM-STAR	Complex Networks	8
MM-LNMB	Heuristic Methods in Operations Research	6
MM-LNMB	Queuing Theory	6
MM-LNMB	Scheduling	6
MM-Diamant	Probabilistic and Extremal Combinatorics	8
MM-Diamant	Coding Theory	8
MM- Diamant	Algorithms Beyond the Worst Case	8

[15] May not be combined with MasterMath Applied Statistics TUD version.
[16] May not be combined with WI4435 Nonparametric Statistics.

MM- Diamant	Semidefinite Optimization	8

The following non-mathematics courses are recommended:

Code	*Course name*	*EC*
AE4446	Airline Operations	4
AE4447	Aircraft Performance Optimization	3
CIE4811-09	Design and Control of Public Transport Systems	6
CIE4821-09	Traffic Flow Theory and Simulation	6
IN4049TU	Introduction to High Performance Computing	6
IN4301	Advanced Algorithms	5
WI4260TU	Scientific programming	3

Specialisation courses for Stochastics:

Choose at least five from the list of courses:

Code	*Course name*	*EC*
WI4231	Mathematical Data Science	6
WI4230	Time series and Extreme Value Theory	6
WI4052	Risk analysis	6
WI4156(TU)	Game theory	6
WI4050	Uncertainty and sensitivity Analysis	6
WI4138	Decision Theory/Expert Judgment	6
WI4225	Interacting particle systems: theory and applications[17]	6
WI4614	Stochastic simulation[18]	6
WI4219	Stochastic differential equations (MM-4TU)	6
MM-STAR	Stochastic processes	8
WI4465	Advanced Topics in Probability	6
WI4470	Mathematical Statistical Physics	6
WI4220	Modelling and analysis of time-to-event data[19]	6
WI4435	Nonparametric Statistics[20]	6
MM-4TU	MasterMath Applied Statistics TUD version[21]	6
MM-4TU	MasterMath Applied Statistics TU/e version	6
MM-4TU	MasterMath Applied Statistics UT version	6

The following mathematics courses are recommended:

Code	*Course name*	*EC*
MM-NDNS+	Dynamical Systems[22]	8
MM-LNMB	Queuing Theory	6
MM-Diamant	Ergodic Theory	8
WI4201	Scientific computing	6
WI4203	Applied Functional Analysis	6
Leiden Univ.	Stochastic Models for Genetic Evolutions	6
Leiden Univ.	Bayesian Statistics	6
Leiden Univ.	Ergodic Theory and Fractals	6

[17] Offered only in even years.
[18] Offered only in uneven years.
[19] Offered only in uneven years.
[20] Offered only in even years. May not be combined with MasterMath Applied Statistics TUD version.
[21] May not be combined with WI4435 Nonparametric Statistics.
[22] May not be combined with WI4042 Dynamical Systems.

Leiden Univ.	Probability on Graphs	6
MM-STAR	Assymptotic statistics	8
MM-STAR	Measure-theoretic probability	8
MM-STAR	Machine learning theory	8
MM-Multi	Forensic probability and statistics	8
MM-Wonder	Discrete choice analysis: theory and application	8
MM-STAR	Time series	8
MM-Diamant	Probabilistic and Extremal Combinatorics	8

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

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

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3
WM1136TU	Written English for technologists-1	3
WM1102TU	Written English for technologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2

   Please note:

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

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

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

Article 7B – The joint Master's Programme in Computer Simulations for Science and Engineering (COSSE)

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

3. The core courses consist of the following courses:

Code	*Name*	*EC*
TW3530COSSE	Numerical Methods II	6
WI4019	Non-linear Differential Equations	6
WI4201COSSE	Scientific Computing (COSSE)	8

WI4204	Advanced Modeling	6
WI4205	Applied Finite Elements (MM-4TU)	6

And two from the following list:

Code	*Name*	*EC*
WI4203	Applied Functional Analysis	6
WI4227-14	Discrete Optimisation	6
WI4430	Martingales, Brownian motion, and Stochastic Processes[23]	6
WI4455	Statistical Inference	6

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

Code	*Name*	*EC*
WI4011	Computational Fluid Dynamics	6
WI4055	Computational Aspects of Stochastic Differential Equations	6
WI4223COSSE	Advanced Modelling Methods	6
IN4049TU	Introduction to High Performance Computing	6
IN4177	Math Biology: the Virtual Cell	6
IN4307	Medical Visualization	5
WI4220	Modeling and analysis of time-to-event data	6
WI4450	Special Topics in Computational Science and Engineering	6

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

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

6. The specialisation courses for Computational Fluid Dynamics may be chosen from the following list:

Code	*Name*	*EC*
WI4011	Computational Fluid Dynamics	6
WI4212	Advanced Numerical Methods	6
WI4475	Data assimilation	6

The specialisation courses for Numerical Linear Algebra may be chosen from the following list:

Code	*Name*	*EC*
IN4049TU	Introduction to High Performance Computing	6

Specialisation courses may also be chosen from the elective Computer Simulation list:

Code	*Name*	*EC*
WI4055	Computational Aspects of Stochastic Differential Equations	6
WI4154	Computational Finance	6
IN4049TU	Introduction to High Performance Computing	6

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

[23] May not be combined with WI4202 Stochastic Processes in any IEP.

6. 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.
7. 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 8 - Bridging programmes for professional education graduates

There are no bridging programmes.

Part 2B Computer Engineering

Article 9 - General

The composition of the exam programme is as follows:

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

Article 10 - Programme details

1. The compulsory core courses are:

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

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

Code	*Name*	*EC*
EE4C03	Statistical Digital Signal Processing and Modeling	5
EE4C04	Control Theory	5
EE4C05	Electromagnetics	5
EE4C06	Networking	5
EE4C07	Advanced Computing Systems	5
EE4C08	Measurement and Instrumentation	5
EE4C09	Structured Electronic Design	5

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

Code	*Name*	*EC*
ET4074	Modern Computer Architectures	5
IN4303	Compiler Construction	5
ET4054	Methods and Algorithms for System Design	5
ET4170	Computer Arithmetic	5
ET4171	Processor Design Project	5
IN4049TU	Introduction to high performance computing	6

3. A list of suggested specialisation courses and specialisation profiles can be obtained from the master coordinator. The list may contain non-CE courses but will then restrict the number of them that can be chosen in the specialization space. For courses that are not on this list, a motivated request to follow that course can be submitted to the board of examiners for approval. Additional core and track core courses can always be taken as specialization course.
4. A thesis project (ET4300) worth 45 credits.
5. 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.
6. A thesis project (ET4300) worth 45 credits[24].

[24] See part 3 Transitional regulations for exceptions for older cohorts.

7. 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 who have had 30 credits or more worth of work experience in their prior education, may not include the internship in their IEP[25].

Code	*Name*	*EC*
ET4399	Extra project	3-15
EE5010	Internship	10-15

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

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

Article 11 - Bridging programmes for professional education graduates

1. Students having obtained a relevant 'HBO degree' from a Dutch institute of professional education in Electrical Engineering (Elektrotechniek), Embedded Systems or Computer Science (Technische Informatica) can gain access to the Master's degree programme via a bridging programme. The bridging programme consists of a minimum of 35 credits in the field of calculus, mathematical modelling and computer engineering.
2. The bridging programme consists of:
   12 credits Mathematics (Calculus and Linear Algebra)
   15 credits Computer Systems
   3 credits Academic skills
   5 credits Courses depending on prior education direction (Electrical Engineering or Computer Science)
3. All students must include the following compulsory courses in their individual bridging programme:

Code	*Name*	*EC*
WI1708TH1	Analyse deel 1	3
WI1708TH2	Analyse deel 2	3
WI1807TH1	Lineaire Algebra 1	3
WI1807TH2	Lineaire Algebra 2	3
EE2S11	Signals and Systems	5

[25] This clause explicitly applies to TU Delft BSc EE students who took the internship minor and students from Dutch HBO programmes. See part 3, Transitional regulations for an exception for older cohorts.

TI2726-C	Operating Systems	5
EE3D11	Computer Architecture and Organisation	5

4. Depending on the prior field of study the individual bridging programme will differ. The different bridging programmes are described in point 4 and 5 below.
5. Students with an HBO degree Computer Science must add the following course to their individual bridging programme:

TI2726-A	Digital Systems	5

6. Students with an HBO degree Electrical Engineering must add the following compulsory course to their individual bridging programme:

TI1316[26]	Algorithms and Datastructures	5

7. Students will gain access to the Master's degree programme if they have their HBO diploma and if they have obtained at least 30 credits which include WI1708TH1, WI1708TH2, WI1807TH1 and WI1807TH2. The remaining study units of the bridging programme that are not included in this set of 30 credits must form part of the Master's degree programme and will be considered compulsory 'homologation courses' in the free elective space, which is restricted to 10 credits.

[26] May be replaced with TI1316TH (a self-study course in the first quarter). Students who started their bridging programme before 2013 can replace TI1316 with ET3155.

Part 2C Computer Science

Article 12 - General

1. The Master's degree programme in Computer Science has two tracks, *Data Science & Technology* and *Software Technology*, described in detail in article 13A and the EIT-ICT Innovation Master School programme specialisations *Digital Media Technology* and *Cloud Computing and Services*, described in article 13B.
2. Students may opt for one of the special programmes in Bioinformatics, Cyber Security or Information Architecture (ref. article 13A, subsection 5), which will be mentioned on the student's diploma supplement under *Specialisation*.

Article 13 - Programme details

Article 13A - The tracks Data Science & Technology (DST) and Software Technology (ST) *without* special programme

1. An IEP in these tracks has a minimum study load of 120 credits and consists of
   a) The Master Kick-off (EWI4000)
   b) a common core,
   c) Computer Science specialisation courses,
   d) a course that provides students with knowledge of the research methods within the field of Computer Science (ref. subsection 4b) or a Literature survey (IN4306)
   e) free electives: courses at academic Master's level that may be chosen freely,
   f) a thesis project (IN5000 Final project) worth 45 credits and
   g) 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),
   - Embedded Software (ES),
   - Interactive Intelligence (II),
   - Multimedia Computing (MC),
   - Network Architectures and Services (NAS),
   - Parallel and Distributed Systems (PDS),
   - Pattern Recognition & Bioinformatics (PRB),
   - Programming Languages (PL)
   - Software Engineering (SE), and
   - Web Information Systems (WIS)
3. The IEP must be drawn up in agreement with the IEP reviewer of the research group in which the student wishes to carry out his or her thesis project. The IEP reviewer is a member of the scientific staff of that research group.
4. The IEP will not be approved unless:
   a. The common core of the tracks consists of at least five[27] course from the related following lists:

Data Science & Technology

Code	*Name*	*EC*
CS4065	Multimedia Search and Recommendation	5
CS4035	Cyber data analytics	5
IN4010(-12)	Artificial Intelligence Techniques	6
IN4073TU	Embedded Real-Time Systems[28]	6

[27] Students who start their studies in academic year 2017-2018 and follow the track Data Science & Technology have to choose only four courses.
[28] No longer offered after academic year 2017-2018.

IN4085	Pattern Recognition	6
IN4086-14	Data Visualization	6
IN4252	Web Science & Engineering	5
IN4301	Advanced Algorithms	5
IN4315	Software Architecture	5

Software Technology

Code	*Name*	*EC*
IN4152	3D Computer Graphics and Animation	5
CS4065	Multimedia Search and Recommendation	5
CS4015	Behaviour Change Support Systems	5
IN4073TU	Embedded Real-Time Systems[29]	6
IN4085	Pattern Recognition	6
IN4150	Distributed Algorithms	6
IN4191	Security and cryptography	5
IN4252	Web Science & Engineering	5
IN4301	Advanced Algorithms	5
IN4303	Compiler Construction	5

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

c. a Literature survey (IN4306) or a course from the list below is part of said IEP. The Literature Study as well as the courses in this list provide students with knowledge of the research methods within the field of Computer Science.

Group	*Code*	*Name*	*EC*
ALG	IN4335	Seminar Algorithms: Economics and Computation	5
ALG	CS4010	Algorithms for Planning and Scheduling	5
CGV	IN4310	Seminar Computer Graphics	5
CYS	CS4120	Seminar Science and Methods in Cyber Security	5
ES	IN4398	Internet of Things seminar	5
II	IN4188	Seminar Affective Computing	5
II	IN4354	Seminar Human-Agent/Robot Teamwork	5
II	CSxxxx	Seminar Intimate Computing	5
II/CGV	CS4125	Seminar Research Methods for Data Science	5
MMC	IN4314	Seminar Selected Topics in Multimedia Computing	5
PDS	IN4392	Cloud Computing	5
PL	CS4130	Seminar Programming Languages	5
PRB	AP3132 D	Seminar Advanced Digital Image Processing	6
SE	IN4334	Software Analytics	5
WIS	IN4326	Seminar Web Information Systems	5

d. the number of credits spent on free electives in said IEP is no higher than 25 credits,

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

f. 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.

[29] No longer offered after academic year 2017-2018.

Article 13B – The tracks Data Science & Technology (DST) and Software Technology (ST) *with* special programme

1. Students may opt for a Special programme in Bioinformatics, Cyber Security or Information Architecture.
2. An IEP in these tracks has a minimum study load of 120 credits and consists of
   a) The Master Kick-off (EWI4000),
   b) The courses required by the special programmes (see below)
   c) a thesis project (IN5000 Final project) worth 45 credits and

The special programme in Bioinformatics

1. Student in the special programme in Bioinformatics follow the Data Science & Technology track and choose one course from the corresponding common core list (ref. article 13A sub-section 4).
2. The following courses are compulsory:

Code	*Name*	*EC*
IN4085	Pattern Recognition	6
IN4170	Databases and Datamining	6
IN4173	Computational Molecular Biology	6
IN4176	Functional Genomics and Systems Biology	6
IN5010	Research Assignment	15

3. At least 37 credits worth of courses from the following list:

Code	*Name*	*EC*
AP3132 D	Advanced Digital Image Processing	6
IN4395	Image analysis in microscopy	6
IN4174 (+p)	Multimedia Information Retrieval	3
IN4177	Mathematical Biology, Virtual cell	6
IN4086-14	Data Visualization	6
IN4178	Optimization (Swarm-based Computation with Applications in Bioinformatics)	6
IN4329	Advanced Bioinformatics	4
IN4322	Mathematical Biology, Metabolic Network	6
IN4396	Bio-modeling and Petri nets	6

4. The thesis is performed under supervision of the Pattern Recognition & Bioinformatics research group.

The special programme in Cyber Security

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

2. The following five courses are compulsory:

Code	*Name*	*EC*
EWI4000	Master Kick-off	0
CS4106	Language based software security	5
ET4397IN	Network Security[30]	5
IN4191	Security and Cryptography	5
SPM5442	Cyber risk management	5
CS4035	Cyber data analytics	5

[30] May not be combined with CSxxxx Advanced Network Security (10 EC), but may be replaced by CSxxxx Advanced Network Security (10 EC).

3. At least one course from the following list:

Code	*Name*	*EC*
CS4120	Seminar Science and Methods in Cyber Security	5
UT201500040	Introduction to Biometrics	5
IN4320	Machine Learning	5
CS4115	Digital Forensics	5
CS4150	System security	5
UT201500042	Privacy Enhancing technologies	5
AP3421 D	Fundamentals of Quantum Information	4
CS4090	Quantum Communication and Cryptography	5
UT192110940	Secure data management	5
UT201500039	Security verification	5
CS4110	Software Testing and Reverse Engineering	5
IN4387	System validation	5
CS4160	Blockchain Engineering	5
IN4253ET	"Hacking Lab" - Applied Security Analysis	5
CS4155	Advanced Network Security[31]	10
IN4150	Distributed Algorithms	5

4. At least four courses from the following list:

Code	*Name*	*EC*
UT201100022	Cyber crime science	5
UT201500038	E-Law	5
WM0824TU	Economics of Security	5
UT201500041	Cyber security management	5
CS4060	Integration week	1,5
UT191612680	Computer Ethics	5

5. The thesis (45 credits) is performed under supervision of the Cyber Security research group.

6. The remaining credits to make up the programme are chosen in consultation with the programme coordinator.

The special programme in Information Architecture

1. Student in the special programme in Information Architecture follow the Data Science & Technology track and choose one course from the corresponding common core list (ref. article 13A sub-section 4).
2. The following courses are compulsory:

Code	*Name*	*EC*
IN4252	Web Science & Engineering	5
IN4325	Information Retrieval	5
IN4331	Web Data Management	5
SEN1141	Managing Multi Actor Decision Making	5

[31] May not be combined with ET4397IN Networks Security (5 EC).

SEN1611	I&C Architecture Design	5
SEN1621	I&C Service Design	5
SEN1121	Complex Systems engineering	5

3. At least one courses from the following list is chosen:

Code	*Name*	*EC*
IN4326	Seminar Web Information Systems	5
IN4306	Literature Survey	10

4. At least two courses from the following list is chosen:

Code	*Name*	*EC*
IN4150	Distributed Algorithms	6
IN4301	Advanced Algorithms	5
IN4315	Software Architecture	5

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

Article 13C – Details of the EIT programmes

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

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

   Both degrees will be certified with an EIT label. To receive a double degree, both universities (first and second year) must be represented by full professors of the ICT departments of these universities in the committee in charge of the examination of the thesis.

Article 13B-I – Specialisation Digital Media Technology (DMT)

1. For students spending their first year at Delft University of Technology, the programme is structured as follows:

Compulsory DMT courses:

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

Comulsory I&E courses:

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

Elective courses:

Code	*Name*	*EC*
IN4326	Seminar Web Information Systems	5
IN4152	3D Computer Graphics and Animation	5
IN4182	Digital Audio and Speech Processing	6
IN4325	Information Retrieval	5
IN4314	Seminar Selected Topics in Multimedia Computing	5
IN4331	Web Data Management	5
IN4393	Computer Vision	5

Elective I&E courses: elect at least 5 credits from the following list:

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

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

Compulsory DMT courses:

Code	*Name*	*EC*
IN4307	Medical Visualization	5
IN5031	I&E Thesis	6
IN5030	Thesis Work	30

Choose two from:

IN4310	Computer Graphics and Animation	5
AP3132 D	Seminar Advanced Digital Image Processing	6
IN4085	Pattern Recognition	6

Specialisation electives (at least 13 credits):

Code	*Name*	*EC*
ET4393	Medical Imaging	5
IN4326	Seminar Web Information Systems	5
IN4152	3D Computer Graphics and Animation	5
IN4182	Digital Audio and Speech Processing	6
IN4325	Information Retrieval	5
IN4314	Seminar Selected Topics in Multimedia Computing	5
IN4331	Web Data Management	5
IN4393	Computer Vision	5

Article 13B-II – Specialisation Cloud Computing and Services (CCS)

For students spending their first year at Delft University of Technology, the programme is structured as follows:

Compulsory courses (21 credits):

Code	*Name*	*EC*
IN4150	Distributed Algorithms	6
IN4392	Seminar Cloud Computing	5
IN4254	Smart Phone Sensing	5

IN4252	Web Science & Engineering	5

Compulsory I&E courses (39 credits):

Code	*Name*	*EC*
Compulsory:		
IN4401	Business development lab	10
IN4394	I&E Summer school	4
MOT9610	Entrepreneurship basic course	5
Select to bring number of credits up to 39:		
WM0506	Ready to startup	6
MOT1461	Financial Management	5
MOT1532	High-Tech Marketing	5
MOT9556	Corporate entrepreneurship	6
MOT1435	Technology, Strategy and entrepreneurship	5
MOT2421	Emerging and Breakthrough Technologies	6

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

Compulsory courses:

Code	*Name*	*EC*
CS4160	Blockchain engineering	5
IN4398	Seminar Internet Of Things	5
IN4326	Seminar Web Information Systems	5
IN5031	I&E thesis	6
IN5030	ICT Innovation thesis project	30

Article 14 – Bridging programmes

Article 14a - For professional education graduates

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

Code	*Name*	*EC*
TI1106M	Calculus[32]	5
TI1206M	Lineair algebra[33]	5
TI1306	Reasoning and logic	5
TI1706	Software quality and testing	5
TI2306	Algorithm design	5
TI2506	Information and data modelling	5
TI2216M	Probability and statistics[34]	5
TI2316	Automata, languages and computability	5
TI3706	Bachelor's Seminar	5

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

[32] May be replaced with WI1708TH1 and WI1708TH2 (total 6 EC)
[33] May be replaced with WI1807TH1 and WI1807TH2 (total 6 EC)
[34] May be replaced by WI2031TH Kansrekening en statistiek (3 EC)

Article 14b – For research university graduates

1. Students having obtained a bachelor's degree from a Dutch research university can, dependent on the programme, gain access to the Master's degree programme via bridging programmes.
2. Students will only be admitted to the bridging programme if their prior education contained at least 5 credits worth of Calculus and 5 credits worth of Linear algebra.
3. The bridging programme for Computer Science consists of the courses listed below.

The following courses are compulsory:

Code	*Name*	*EC*
TI1206	Object oriented programming	5
TI1316	Algorithms and data structures	5
TI1306	Reasoning and logic	5
TI1706	Software quality and testing	5
TI2306	Algorithm design	5
TI2506	Information and data modelling	5
TI2216M	Probability and statistics[35]	5
TI2316	Automata, languages and computability	5

Students choose one of the following courses:

Code	*Name*	*EC*
TI2206	Software engineering methods	5
TI2606	Concepts of programming languages	5
TI2736-A	Computational Intelligence	5
TI2736-C	Data mining	5

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

[35] May be replaced by WI2031TH Kansrekening en statistiek (3 EC)

Part 2D Electrical Engineering

Article 15- General

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

Article 16 – Programme details

Article 16A – Composition of the track programmes

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

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

and three courses chosen from the following list:

Code	*Name*	*EC*
EE4C03	Statistical Digital Signal Processing and Modeling	5
EE4C04	Control Theory	5
EE4C05	Electromagnetics	5
EE4C06	Networking	5
EE4C07	Advanced Computing Systems	5
EE4C08	Measurement and Instrumentation	5
EE4C09	Structured Electronic Design	5

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

Code	*Name*	*EC*
CS4055	High Performance Data Networking	5
EE4560	Information Theory	5
EE4565	Propagation and Scattering of EM Waves	5
ET4169	Microwaves, Radar & Remote Sensing	5
ET4358	Wireless Communications	5
ET4386	Estimation and Detection	5
ET4394	Wireless Networking	5

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

Code	*Name*	*EC*
EE4520	Analog CMOS design I	3
EE4585	Semiconductor Device Physics	5
EE4605	Integrated Circuits and Systems for Wireless Applications	5
ET4257	Sensors and Actuators	4
ET4289	Integrated Circuits and MEMS Technology	4
EE4610	Digital IC design I	3
EE4615	Digital IC design II	3

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

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

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

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

3. A list of suggested specialisation courses and specialisation profiles can be obtained from the master coordinator of the track. The list may contain non-EE courses but will then restrict the number of them that can be chosen in the specialization space.
   For courses that are not on this list, a motivated request to follow that course can be submitted to the board of examiners for approval. Additional main core and track core courses can always be taken as specialization course.
4. If a student does not have all the prior knowledge and skills required for the Master's degree in Electrical Engineering, he or she may include in the free elective space courses worth at most 10 credits at Bachelor's level to obtain these. For subjects that are not explicitly indicated as homologation for the track approval by the Board of Examiners is required.
5. A thesis project (ET4300) worth 45 credits[36].
6. The free elective space may be used for courses, an internship or an extra project.

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

   Students who have had 30 credits or more worth of work experience in their prior education, may not include the internship in their IEP[37].

[36] For exceptions for older cohorts: see Part 3 Transitional regulations.
[37] This clause explicitly applies to TU Delft BSc EE students who took the internship minor and students from Dutch HBO programmes. See part 3, Transitional regulations for an exception for older cohorts.

Code	*Name*	*EC*
ET4399	Extra project	3-15
EE5010	Internship	10-15

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

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

Article 16B – Erasmus Mundus Programme European Wind Energy Master (EWEM) in Electric Power Systems

1. Students in the Erasmus Mundus Master's Programme in European Wind Energy Master (EWEM) follow the programme required by Erasmus Mundus. This programme requires that students attend three of the four partner-universities during the two years MSc programme. At least two universities must be represented by professors of the involved departments of these universities in the committee in charge of the examination of the thesis.
2. An individual study programme of students in the EWEM elective profile Electric Power Systems consists of:
   a. Core courses worth 31.5 credits
   b. Elective courses worth at least 43.5 credits
   c. The thesis project worth 45 credits
3. The courses are followed at the University of Technology Denmark (DTU) in the first semester, at Delft University of Technology (TUD) the second semester and at Norwegian University of Science and Technology (NTNU)in the third semester of the programme (first semester of the second year).
4. The complete programme is describe 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 16C – Double degree programme in Microelectronics at Delft University of Technology and Tsinghua University, Beijing

1. Students in the Double degree programme in Microelectronics with Tsinghua University (THU), Beijing follow a different programme. This programme requires that students attend both partner-universities during the two years and additional three month duration of this MSc programme. Both 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 a student starting at Delft University of Technology (DUT) is composed as follows:
   - Year 1: 60 credits worth of coursework at DUT of which 26 credits are compulsory.
   - Year 2 and additional three months of the third year: 20 THU credits worth of course work at THU and a Thesis project worth 45 ECTS credits, also at THU.
3. An individual study programme of a student starting Tsinghua University is composed as follows:
   - Year 1: 60 credits worth of coursework at THU,
   - Year 2 and the additional three months of the third year : 26 credits worth of coursework at DUT and a Thesis project worth 45 credits.
   - The remaining nine months of the 3rd year: a 2nd Thesis project at THU.
4. The Delft University of Technology Electrical Engineering Master's degree will be awarded
   a. if a student has earned a passing grade for all study units of the programme described under subsection 2
      or
   b. if a student has earned a passing grade for all study units of the programme described under subsection 3.

Article 17 - 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 (as described in Article 2) via a bridging programme.
2. The bridging programme consists of 40 credits in the field of calculus, mathematical modelling, electrical engineering and academic skills; the precise composition depends on the track or the specialisation that the student intends to follow.
3. The bridging programmes are composed of:
   a. 15 credits Mathematics (Calculus and Linear Algebra)
   b. 15 credits Fundamental electrical engineering knowledge
   c. 5 credits Track specific knowledge
   d. 5 credits academic skills
4. 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.
5. The bridging program is comprised of the following study units, where the track-specific courses are compulsory for the students that will enrol in the given track:

		Code	*Name*	*EC*
Mathematics		WI1708TH1	Analyse deel 1	3
		WI1708TH2	Analyse deel 2	3
		WI1708TH3	Analyse deel 3	3
		WI1807TH1	Lineaire Algebra deel 1	3
		WI1807TH2	Lineaire Algebra deel 2	3
Fundamental electrical engineering		Signals and Systems track: choose following 4 courses Other tracks: choose 3 out of following 4 courses, add 4th course as homologation course in MSc program		
		E2S11	Signals & Systems	5
		EE3P11	Elektromagnetisme	5
		EE2S31	Signal Processing	5
		EE2S21	Systeem- en regeltechniek	5
Track specific	TCSS	EE8001	Telecommunications Networks	2
		EE8020	Telecommunication Techniques	3

know-ledge	ME	EE3C11	Electronics	5
	ESE	EE2E11	Electrical Energy Conversion	5
Academic skills		EE8002	Literature Study for Electrical Engineering	2

6. Students will gain access to the Master's degree programme if they have obtained their HBO diploma and earned a mark greater than or equal to 6.0 for a set of study units that add up to at least 40 credits as described in the tables above.

Part 2E Embedded Systems

Article 18 - General

The composition of the exam programme is as follows:

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

Article 19 – Programme details

1. The core courses are:

Code	*Name*	*EC*
EWI4000	Master Kick-off	0
ET4074	Modern Computer Architectures	5
IN4390	Quantitative Evaluation of Embedded Systems	5
CS4140ES	Embedded Systems Laboratory	5
IN4343	Real-time Systems	5
IN4387	System Validation	5

2. The specialisation consists of
   1. courses worth at least 20 credits from one of the specialisation list,
   2. Additional courses worth at least 25 credits, which may be chosen from the ES specialisation lists, the project and internship list and the language course list (max. 6 credits) or from other Master's programmes.

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

   The three specialisation lists:

   Computer Architecture with the following courses:

Code	*Name*	*EC*
EE4C07	Advanced Computing Systems	5
ET4054	Methods and Algorithms for System Design	5
ET4076-11	VLSI Test Technology & Reliability	5
ET4170	Computer Arithmetic	5
ET4171	Processor Design Project	5
EE4610	Digital IC design I	3
EE4615	Digital IC design II	3
ET4351	VLSI Systems on Chip	4
IN4350	Embedded Computer Architectures 2	5
EE4575	Electronics for quantum computing	5

   Control Systems with the following courses:

Code	*Name*	*EC*

EE4C04[38]	Control System Design	5
SC42015[39]	Control Theory	6
SC42025	Filtering & identification	6
SC42040	Model Predictive Control	4
SC42050	Knowledge Based Control Systems	4
SC42055	Optimization in Systems and Control	4
SC42060	Modelling and Nonlinear Systems Theory	4
SC42075	Modeling and Control of Hybrid Systems	3
ME46085	Mechatronic System Design	4
SC42095	Digital Control	3
ME41110	Vehicle Mechatronics	4
ME41115	Vehicle Dynamics B - Antilock Braking Systems	3

Software & Networking with the following courses:

Code	*Name*	*EC*
CS4010	Algorithms for Planning and Scheduling	5
EE4C06	Networking	5
ET4285	Measuring and simulating the Internet	4
ET4394	Wireless Networking	5
ET4397IN	Network security[40]	5
IN4150	Distributed Algorithms	6
IN4301	Advanced Algorithms	5
IN4303	Compiler Construction	5
IN4315	Software Architecture	5
IN4351	Real-Time Software Development	5
IN4398	Internet of Things seminar	5
CS4155	Advanced Network Security[41]	10

The project and internship list is:

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

Please note:

Students may choose only one item from the project and internship list. EE5010 may only be chosen by students whose prior education included 30 credits or less worth of work experience. Students who wish to carry out their Thesis project outside TU Delft (i.e. in a company or other organisation) in any case may not include the internship in their IEP.

The language course list:

Code	*Name*	*EC*
WM1101TU	English for academic purposes-3	3
WM1135TU	English for academic purposes-4	3

[38] May be replaced by SC42000 Control System Design (3 credits).
[39] May not be combined with EE4C04 Control System Design (5 credits) or SC42000 Control System Design (3 credits).
[40] May not be combined with CSxxx Advanced Network Security (10 EC).
[41] May not be combined with ET4397IN Network Security (5 EC)

WM1136TU	Written English for technologists-1	3
WM1102TU	Written English for technologists-2	3
WM1137TU	Spoken English for technologists-1	2
WM1112TU	Spoken English for technologists-2	2
WM1115TU	Elementary 1 Dutch for foreigners	3
WM1116TU	Elementary 2 Dutch for foreigners	3
WM1117TU	Dutch intermediate 1	3

Please note:

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

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

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

   The subjects to be completed are chosen in collaboration with and decided on by the master coordinator. Depending on the amount of subjects required, students opt for one of the following courses:

Code	*Name*	*EC*
ES4001	Homologation Embedded Systems	5
ES4002	Homologation Embedded Systems	7.5
ES4003	Homologation Embedded Systems	10

   If less than 5 credits worth of homologation courses is required, the students must chose additional specialisation courses instead.

Article 20 - Bridging programmes for professional education graduates

1. Students having obtained a relevant 'HBO degree' from a Dutch institute of professional education in Electrical Engineering (Elektrotechniek), Embedded Systems or Computer Science (Technische Informatica, HBO-ICT track Systems and Networking Engineering) can gain access to the Master's degree programme via a bridging programme. The bridging programme consists of a minimum of 45 credits in the field of calculus, mathematical modelling and computer engineering.
2. The bridging programme consists of:
   - 12 credits Mathematics (Calculus and Linear Algebra)
   - 20 credits Computer Systems and Fundamental Computer Science
   - 3 credits Academic skills
   - 10 credits Courses depending on prior education direction (Electrical Engineering or Computer Science)
3. All students must include the following compulsory courses in their individual bridging programme:

Code	*Name*	*EC*
WI1708TH1	Analyse deel 1[42]	3
WI1708TH2	Analyse deel 2[43]	3
WI1807TH1	Lineaire Algebra 1[44]	3
WI1807TH2	Lineaire Algebra 2[45]	3

[42] Alternative Course: WI1708TH1 and WI1708TH2 (total 6 EC) can be replaced with TI1106M Calculus, 5EC
[43] Alternative Course: WI1708TH1 and WI1708TH2 (total 6 EC) can be replaced with TI1106M Calculus, 5EC
[44] Alternative Course: WI1807TH1 and WI1807TH2 (total 6 EC) can be replaced with TI1206M Lineaire Algebra, 5 EC
[45] Alternative Course: WI1807TH1 and WI1807TH2 (total 6 EC) can be replaced with TI1206M Lineaire Algebra, 5 EC

TI1306	Reasoning and Logic	5
TI2726-C	Operating Systems	5
EE2S11	Signals and Systems	5
EE3D11	Computer Architecture and Organisation	5

4. Depending on the prior field of study the individual bridging programme will differ. The different bridging programmes are described in point 6 and 7 below.

5. Students with an HBO degree Computer Science must add the following courses to their individual bridging programme:

TI2726-A	Digital Systems	5
EE2S21	Systeem- en regeltechniek	5

6. Students with an HBO degree Electrical Engineering must add the following compulsory courses to their individual bridging programme:

TI1316	Algorithms and Datastructures	5
TI2206	Software Engineering Methods	5

7. Students will gain access to the Master's degree programme if they have obtained their HBO diploma and at least 30 credits which include WI1708TH1, WI1708TH2, WI1807TH1 and WI1807TH2 (or the suggested alternative courses TW1105TI and TW1205TI). The study units of the bridging programme that are not included in this set of 30 credits must form part of the Master's degree programme and will be considered compulsory 'homologation courses', which is restricted to 10 credits. In this case, the codes and study loads of article 25 subsection 3 apply.

Part 2F Sustainable Energy Technology

Article 21A – General

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

   Students choose one of these specialisations 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 specialisation worth 36 credits;
   3. an elective space worth 15 credits and
   4. a graduation project worth 45 credits.

Article 21B – 4TU character of the Master's degree programme Sustainable Energy Technology

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

Article 22 - Programme details

1. The core courses are:

Code	*Name*	*EC*
EWI4000	Master Kick-off	0
SET3013	Renewable Energy	4
WM0201SET	Technical writing	2
SET3060	Energy System Optimization	5
SET3055	Economics and Regulations of sustainable energy	4
SET3815	System Integration Project	9

2. The specialisations are composed of combinations of three profiles. Students follow all courses of the three profiles their specialisation is composed of:

Specialisation	*Profiles*					
	Bio	Power	Economics	Solar	Storage	Wind
Autonomous systems				X	X	X
Solar systems		X		X	X	
Bio/solar systems	X			X	X	
Wind & economics		X	X		X	
Solar & economics		X	X	X		

Biomass & economics	X	X	X

The profile courses are:

Code	*Name*	*EC*
Profile 'Biomass'		
	Thermochemistry of biomass conversion	4
	Biochemistry of biomass conversion	4
CH3061	Multiphase reactor engineering	4
Profile 'Power'		
ET4119	Electronic power conversion	4
	Intelligent electrical power grids	4
EE4545	Electric power systems of the future[46]	4
	AC and DC Microgrids[47]	4
Profile 'Economics and Society'		
WM0931SET	Sustainable Energy Innovations and Transitions	4
WM0637SET	Economic Policy for Sustainable Energy	4
WM0638SET	Sustainable Business Venturing	4
Profile 'Solar'		
ET4376	Photovoltaics Basics	4
ET4377	Photovoltaics Technologies[48]	4
ET4378	Photovoltaics Systems[49]	4
Profile 'Storage'		
	The necessity of storage technology	4
	Battery technology	4
	Hydrogen technology	4
Profile 'Wind'		
AE3-W02	Introduction to Wind Energy	4
AE4W13	Site conditions for Wind Turbine Design	4
AE4W09	Wind Turbine Design	4

3. The elective space should be used for one of more of the following purposes:
   - To gain work experience (SET3822 Internship MSc SET, 15 credits),
   - To gain research experience (ET4399 Extra Project, max. 15 credits),
   - To broaden their knowledge of the SET field[50],
   - To deepen knowledge of the SET profile (see below), profile electives
   - To gain entrepreneurship skills (max. 6 credits, see below)
   - To further develop language skills (max. 3 credits, see below).

   For students who wish to deepen their knowledge of their SET profile, each profile offers an advanced course. Please note that the thesis supervisor may make one of these courses mandatory.

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

   Profile electives courses

Profile	*Code*	*Name*	*EC*
Biomass		Process design	

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

Power	High voltage constructions
	Electrical machines and drives
Economics & Society	Economy of future energy systems
	Technology and global development
Solar	Photovoltaics lab
	PV materials processing & characterization
Storage	CO2 neutral fuel and feedstock
Wind	Offshore wind farm design
	Airborne wind energy
	Multidisciplinary design optimization for aerospace applications

Entrepreneurship

Code	*Name*	*EC*
MOT1461	Financial Management	5
MOT1532	High-Tech Marketing	5
MOT9556	Corporate entrepreneurship	6
WM0516TU	Turning Technology into Business	6
WM0506TU	Ready to startup	6

Language courses

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

Please note:

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

4. The graduation project (SET3901) worth 45 credits is performed under supervision of one of the research groups affiliated with the specialisation chosen by the student. It is subject to the Rules and Regulations of the Board of Examiners of the faculty of EEMCS[51] and what is stated in article 3 of this appendix.

Article 23 – Bridging Programme

For students with a research university background

Civiele techniek, 12 EC

Code	*Name*	*EC*
WB2230-15	Systeem en Regeltechniek	6
WB2540 Toets 3	Warmte-overdracht	3

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

WB2540 Toets 4	Practica Stroming en Warmte	0
WB2541 Toets 1	Engineering Thermodynamica	3

For students with a vocational education (HBO) background

Students with a vocational education (HBO) in Mechanical Engineering (*Werktuigbouwkunde*), Electrical Engineering (*Elektrotechniek*), Chemical Engineering (*Chemische Technologie*), Aerospace Engineering (*Lucht- en ruimtevaarttechniek*) and Applied Physics (*Technische Natuurkunde*) may gain access to the programme after completing the following bridging programme:

Code	*Name*	*EC*
WI1708TH1	Analysis 1	3
WI1708TH2	Analysis 2	3
WI1708TH3	Analysis 3	3
WI1808TH1	Lineaire Algebra	3
WI1909TH	Differential Equations	3
WB2230-15	Systeem en Regeltechniek	6
WB2540	Stroming en Warmte	6
WB2541 T1 S	Process Engineering and Thermodynamics	3

Students will only be admitted to this bridging programme if they have met the general requirements of Delft University of Technology for admission to bridging programmes, as well as the following SET specific requirements:

Students must have completed their vocational programme

a) Nominally, that is within 4 years and
b) With a weighted average grade of 75% for all courses or part of the programme.

Part 3 Programme transitions

Article 24 – Course equivalencies

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

Course no longer on offer				Equivalent course(s) on offer		
Code	*Name*	*EC*		*Code*	*Name*	*EC*
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		ESxxxx	Embedded Systems Laboratory	5
IN4342	Embedded Systems Laboratory	5		ESxxxx	Embedded Systems Laboratory	5
SEN1511	Engineering Optimization and Integrating Renewables in Electricity Markets	5		SET3060	Energy System Optimization	5
SET3041	Energy from Biomass	4		CHxxxx	Thermochemistry of biomass conversion	4

Article 25 – Embedded Systems

1. On 31 August 2015 a revised Embedded Systems programme was introduced. Within this programme, only 10 credits may be spent on homologation (ref. article 19, sub-section 3).
2. Students who enrolled in 2017-2018 or earlier may also opt for the following, larger homologations courses:

Code	*Name*	*EC*
ES4004	Homologation Embedded Systems	12.5
ES4005	Homologation Embedded Systems	15

3. The extra credits spent on homologation are subtracted from the specialisation part of the programme.
4. The aforementioned courses must be submitted to the Board of Examiners before the end of 2016-2017.
5. a. As of academic year 2017-2018 the compulsory course IN4342 Embedded Systems Laboratory will be replaced by the course Embedded Systems Laboratory[52].

   b. As of academic year 2017-2018 the course IN4073TU Embedded real time systems will no longer be on offer. Students whose IEP contains this course but have to passed it must replace it with another specialisation course.

   c. The courses IN4073TU Embedded real time systems and Embedded Systems Laboratory may not be part of the same IEP.

Article 26 - Sustainable Energy Technology

1. On 4 September 2017 a revised Sustainable Energy Technology was introduced.
2. Students with an approved IEP according to the previous programme may finish 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 substitutions as stated in sub-section 4 and the course equivalencies in article 20. However, the total number of credits of the IEP must be at least 120 credits. The total number of core courses must be at least 23 credits. In this case the missing credit is added to the elective space. Any change in the IEP that is not covered by the course equivalencies in sub-section 4 requires the approval of the Board of Examiners.
3. Students wish to transfer to the new programme may draw up their IEP according to programme 2017, with the provision that they may substitute old courses for new courses according to the table in sub-section 4.
4. The following course substitutions are allowed:

	new course				***old course***	
code	*Name*	*EC*		*code*	*name*	*EC*
SET3055	Economics and regulation of sustainable energy systems	4		SEN1521	Electricity and gas: markets design and policy issues	5
SET3815	System Integration Project	9		ET4380SET	SIP-1	6
				and		
				WM0203TU-Eng	Oral Presentation	2
EE4536	AC and DC Microgrids	4		EE4535	AC and DC Microgrids	3
WM0931SET	Sustainable Energy innovations and transitions	4		WM0930SET	System Innovation and Strategic Niche Management	3
			and	SET0931	Additional assignment for WM0931SET	1
WM0637SET	Economic Policy for Sustainable Energy	4		WM06036SET	Sustainable Energy Economics	3

[52] See the electronic study guide for the course code.

			an d	SET0637	Additional assignment for WM0637SET	1
WM0638SE T	Sustainable Business Venturing	4		MOT9610	Entrepreneurship basic course	5
SET3822	Internship MSc SET	15		SET3822	Internship MSc SET	15

5. In the academic year 2017-2018 two more opportunities to sit the written examinations of courses from the previous SET programme that are no longer offered.
6. These transitional regulations are valid until 31 August 2019.