

**3 TU.**



**IMPLEMENTATION REGULATIONS**

**2015-2016**

**3TU MASTER OF SCIENCE PROGRAMME  
CONSTRUCTION MANAGEMENT AND ENGINEERING (CME)**

**DELFT UNIVERSITY OF TECHNOLOGY**

## a. Composition of the study programme

The programme ensures that there is available a current study guide – at least in digital form. For (at the minimum) all the courses stated in Articles a to d inclusive, this guide contains a description of the content, learning objectives, form of teaching and manner of examining.

1. The study programme is composed as follows:
  - a. The 'Cornerstones' are the Core programme, 28 EC

The core programme consists of the following four courses:

	TUD	
Legal and Governance	AR8002	7 EC
Project Management	SPM8000	7 EC
Process Management	SPM8002	7 EC
Collaborative Design and Engineering	CME1200	7 EC

- b. Obligatory specialism-related courses, 31 EC, as described in paragraph b.
  - c. Free elective courses, 25 EC, as described in paragraph j.
  - d. Graduation work, 36 EC
2. Students undertake graduation work of 36 EC which relates to the specialisation (or track) they have chosen at Delft University of Technology.
3. The graduation work consists of a component 'Preparation for Thesis' of 4 EC and a graduation project + report and presentation of 32 EC. The total of Graduation Work is 36 EC. The component 'Preparation for Thesis' consists of a more in-depth study of the graduation subject and the production of a set-up for and planning of the graduation project, called Proposal.
4. Students who come under consideration for admission on the basis of a bachelor's degree awarded by a Dutch university of professional education (HBO) can only be admitted to the programme after rounding off the preparatory programmes (CME Schakelprogramma) as mentioned in appendix 4.
 

The courses of the pre-master programme are mentioned in Appendix 4.

Students who have passed the preparatory programme have the right to join the programme in any of the three locations of the Universities of Technology in Delft, Enschede as well as Eindhoven.
5. Students can put together their own study programme associated with an examination. The study programme must have the approval of the CME Examination Committee beforehand.

Approval is granted when, in the judgement of the examination committee, it is plausible that the proposed programme leads to the achievement of the objectives of the programme as formulated in appendix 2 to this implementation regulation.

**b. Programme of specialism (obligatory courses)**

The obligatory programme of specialisms consists in the following courses:

Course code	Course	EC
CME1210	Infrastructure Asset Management	7 EC
CME2200	Dynamic Control of Projects	4 EC
CIE4130	Probabilistic Design	4 EC
CME2300	Financial Engineering	4 EC
CIE4030	Methodology for Scientific Research	3 EC
EPA1432	Cross-cultural Management	5 EC
WMO312CT	Philosophy, Technology Assessment and Ethics	4 EC

**c. Organisation of practical exercises:**

The following study components include practical exercises in the sense of Article 1.a, in the format indicated:

Cornerstone	Format
Legal and Governance	Virtual lectures
Project Management	Lectures, project
Process Management	Assignments and lectures
Collaborative Design and Engineering	Project work, lectures and workshops

**d. Study load of the degree programme and of each of the study components it comprises:**

The study load of the master programme is 120 credits. Of these 120 EC no EC may be part of what belongs to a previously passed bachelor's examination. The study load of the study components is indicated under respectively a, b and j.

**e. Number and frequency of the examinations and practical exercises:**

1. Written and oral (interim) examinations are taken immediately following the teaching period in which the education is provided.
2. At least one repeat opportunity is offered for each written (interim) examination. A timetable of these repeat examinations is published at the beginning of the study year.
3. Practicals can be done in agreement with the relevant timetables.

**f. Form of the degree programme**

The programme may be followed full time.

**g. Format of examinations:**

1. The (interim) examinations are taken in the manner prescribed for the relevant course in the study guide.
2. (Interim) examinations of courses, which are given by another programme to the CME programme are taken in the manner determined in or in accordance with the Education and Examination Regulations for CME.

**h. Conditions for admission to the examinations**

Students may only take part in the examinations listed below after they have passed the corresponding examinations listed under respectively a, b and j.

- CME2001 Preparation, 4 EC
- CME2000 Thesis, 32 EC

**i. Participation in practical exercises:**

The educational programme Construction Management & Engineering consists a number of practical exercises in the form of design projects. Practical exercises can also be a part of a course, which is completed with a written exam. More information about these practical exercises can be found in the course descriptions. For the accomplishment of the master thesis, there is a guide available.

Usually the opportunity to participate in a project or practical is offered only once per year. If – for reasons beyond his control – a student has not been able to participate in a project or practical in accordance with the regular schedule, the Examination Board will try – to the best of its ability – to enable the student still to carry out the project or practical.

**j. The elective study components from which students must choose for the elective parts of their degree programmes:**

1. The student can fill in the free elective courses of the programme. For this purpose the elective courses in the list given below are automatically allowed. The agreement of the examination committee and the education management is required for other optional courses.

Course code	Course	EC
AE4451	Network and Fleet Planning	3 EC
AE4456	Safety of Transportation	3 EC
AR01R25	Real Estate Management	7 EC
AR0880	Real estate valuation	7 EC
AR1R050	Real estate economics, finance and planning	4 EC
CIE4020	Project Finance	4 EC
CIE4100	Materials and Ecological Engineering	4 EC
CIE4120	Information Systems for Infrastructures and Buildings	4 EC
CIE4170	Construction Technology of Civil Engineering Structures	4 EC
CIE4480	Integral Design and Management	4 EC
CIE4760	Assessment of transport infrastructure and systems	6 EC
CIE5720	Environmental Impact Assessment	4 EC
CIE5750	Planning: Policy, methods and institutions	4 EC
CIE5981	Forms of collaboration in Civil Engineering	4 EC
CME2210	Open Design and Construction Management – An Operations Research Approach	4 EC
EPA1123	Policy analysis of Multi-Actor systems	5 EC
EPA1233	Economics of infrastructures	6 EC
EPA1322	Continuous Systems Modelling	5 EC
EPA1422	Inter-organizational decision making	6 EC
SPM4110	Designing multi-actor systems	6 EC
SPM4416	Strategic management of large engineering projects (capita selecta )	3 EC
SPM4530	Agent Based Modelling of complex Networks	4 EC
SPM9155	Advanced system dynamics	4 EC
SPM9431	Public private partnership	6 EC
SPM9537	Integrated Plant Management	5 EC
SPM9716	Cost-Benefit-Analysis: Theory and applications	4 EC
WI2608	Optimization	6 EC
WI4051	Introduction to Operations Research	4 EC
CIE4061	Multidisciplinary project	10 EC*
CME2100	Internship	10 EC*

\* only one of these courses is permitted as elective course

2. A selection of the elective courses is packed together in "Tracks" as mentioned in the "CME 2000 – Graduation Thesis Guideline".

3. Where the previous education of a student admitted to the programme does not completely match the programme, the admissions committee can specify additional courses with a total of at most 10 EC (deficiency courses) which replace one or more optional courses stated in paragraph 1.

In accordance with this article paragraph 2 the following additional courses can be dedicated to students with a bachelor or equivalent study:

#### BSc Architecture, Delft

Vakcode	Vak	EC
WI1708TH1	Analyse 1	3
WI2031TH	Kansrekening en statistiek voor HBO-instromers	3
WI1807TH	Lineaire Algebra	3

#### BSc TPM, Delft

Vakcode	Vak	EC
CTB2410	Waterbouw	5

#### BSc Civil Engineering Delft

Vakcode	Vak	EC
WM0201TU	Technical writing	2
EPA1123	Policy Analysis of Multi-Actor Systems	5

#### PreMaster CME at TU Eindhoven or University Twente

Vakcode	Vak	EC
WI1708TH1	Analyse 1	3
WI2031TH	Kansrekening en statistiek voor HBO-instromers	3
WI1807TH	Lineaire Algebra	3

#### Other studies at University of Technology

##### BSc Delft (TNW, LNR, 3ME, EWI)

Vakcode	Vak	EC
CT-MI-174-13	Project Management: from Nano to Mega (minor)	30

##### BSc Delft (IO)

Vakcode	Vak	EC
Pre Master CME	Pre Master HBO CME	36

#### k. Admission requirements for issuing proof of admission

The admission requirements for the Master's degree programme correspond to the qualities regarding the knowledge, insight and skills that students obtained at the time of finishing their Bachelor's degree programme.

Admission of international students:

1) Command of English: following the introduction of teaching in English, students must have an IELTS or comparable total score of at least 6.5, in which all parts should be assessed with "sufficient".

Comparable scores are:

- TOEFL internet-based: 90
- Cambridge certificate: CPE-C or CAE-C

- 2) The level of education in the country in which the student has completed his/her pre-university education: this must be more or less comparable with that in the Netherlands.
- 3) Level of knowledge: the student must also have accumulated sufficient knowledge on the basis of the subjects he/she has studied abroad. It must be at a level comparable to that of Dutch students who are admitted to the Master's programme.

**I. Bachelor's degree certificates that provide direct access to the Master's programme**

The following Bachelor's degree certificates from the institutions for higher education indicated below provide direct access to the Master's programme:

- bachelor programmes Architecture (TUD, TU/e)
- bachelor programmes Civil Engineering (TUD, UT)
- bachelor programmes Technische Bedrijfskunde (TU/e, UT)
- bachelor programme Systems Engineering, Policy Analysis & Management (TUD)
- bachelor programme Technical Innovation Sciences (TU/e)

In this, following deficiency courses can be mandatory according to j. 2

**m. Transitional regulations**

Not applicable

## Appendix 1

### ***The business of passing the master's examination according to the regulations (from the Rules and guidelines of the examination committee)***

1. The student has passed the master's examination when he has gained a mark  $\geq 6$  for all components of the examination programme.
2. The examination committee can declare students who have not satisfied the requirement for the master's examination as mentioned in paragraph 1 as having passed, when in its opinion the student has clearly shown that he satisfies to a sufficient extent the objectives of the programme.

#### ***Cum Laude:***

- The weighted means of the marks, achieved for parts of the final exam excluding the final mark for the graduation work, are at least 8.0, not taken into account are the 'passed' (voldoendes, v) and exemptions (vrijstellingen, vr)
- The fraction of classes with the mark V or VR cannot exceed more than one-third of the total classes
- No mark below 7.0 is allowed
- The master project should have a mark of at least 8.5
- At Delft, there also a limitation of study duration of 2.5 years

### ***The business of passing the preparatory programme according to the regulations for students with a bachelor's degree from a Dutch university of professional education (from the Rules and guidelines of the examination committee)***

The student has passed the preparatory programme when he has gained a mark  $\geq 6$  for all components of that programme. In relation to this the following additional rules apply per institution:

The opportunity to re-take examinations is offered.

#### **CME Pre-master Programme**

For the courses Analysis 1, 2 and 3 the weighted average must be at minimum a 6.0, in which for each part at least a 5.0 must be obtained. The parts as well as the weighted average are not rounded off.

Students may begin their final thesis when they have passed the cornerstones, specialised courses and free elective courses.

## Appendix 2 - Final attainment level (programme objectives) of the CME Master's programme

In this section we will describe the skills and knowledge of a graduate in Construction Management & Engineering and provide an indication of his or her general academic level.

### 2.1 Domain-specific requirements

The domain-specific requirements as specified below are based upon:

- a. the needs of the construction industry as well as on the needs emerging from the development of society and innovations as outlined in the "Introduction" to this document. Also, with regard to this domain, an important characteristic of the development and application of newly acquired knowledge is the fact that it has to be introduced in existing managing and engineering practices. In other words, students also have to become familiar with the management of transition processes and organizational changes in the construction industry;
- b. the domain-specific and internationally accepted qualifications as defined by the ABET organization (Accreditation Board for Engineering and Technology)

The domain-specific requirements have been translated into final qualifications that fit into the 3TU Academic criteria in which the academic level of the programme is indicated as well. The Master of Science 'Construction Management and Engineering':

<b>3TU Academic Criteria</b>	<b>Description of the Learning Outcomes</b>
1. Competent in one or more scientific disciplines	<ul style="list-style-type: none"> <li>▪ The graduate has knowledge on the following sub-areas of Construction Management and Engineering, is an expert in at least one of them and is able to maintain and expand his expertise in the field of Construction Management and Engineering (for instance, by consulting relevant literature but also look for connections).                             <ul style="list-style-type: none"> <li>○ Project and Process management in the field of Construction Engineering (i.e. complex constructions, large-scale infrastructure, urban developments)</li> <li>○ Legal and Governance aspects in the field of Construction Engineering</li> <li>○ Markets and organisations in the field of Construction Engineering</li> <li>○ Innovations and Integral Design in Construction Engineering</li> </ul> </li> <li>▪ The graduate is able to combine management theory and technical knowledge. This ability covers the knowledge and application of technical process management and innovation regarding construction and engineering processes in the subareas above.</li> </ul>
2. Competent in doing research	<ul style="list-style-type: none"> <li>▪ The graduate has the competence to acquire new scientific knowledge through research or systematic reflection.</li> <li>▪ He understands the potential benefits of research and is able to understand and incorporate the results of research into his own work.</li> </ul>
3. Competent in designing	<ul style="list-style-type: none"> <li>▪ The graduate is able to                             <ul style="list-style-type: none"> <li>○ Contribute to a functional design of complex constructions or</li> <li>○ Design management processes in the field of Construction Engineering</li> </ul> </li> </ul> <p>This means that:</p> <ul style="list-style-type: none"> <li>▪ The graduate has creativity and synthetic skills with respect to design projects</li> <li>▪ The graduate is application-oriented towards the construction industry when designing constructions or management processes</li> <li>▪ The graduate is able to translate technological concepts and developments into appropriate process innovations for construction.</li> <li>▪ The graduate is able to find a balance between possible solutions of complex requirements, technical possibilities, genuine interests of the parties involved and justified value creation on scientific and operational levels</li> </ul>
4. A scientific approach	<ul style="list-style-type: none"> <li>▪ The graduate has the habit of reflecting upon his own work and continuously uses relevant information to improve his capabilities.</li> <li>▪ The graduate has the attitude to endorse his personal development and enhancing his expertise.</li> <li>▪ The graduate knows that models only approximate reality and is able to develop and use them adequately whenever this is beneficial</li> <li>▪ The graduate makes decisions based on calculated risks, costs, time, quality, stakeholders' participation, value creation, legislation and is able to evaluate these decisions</li> <li>▪ The graduate's scientific attitude is not restricted to the boundaries of Construction Management and Engineering, and he is able to cross these where and whenever necessary</li> </ul>



<b>3TU Academic Criteria</b>	<b>Description of the Learning Outcomes</b>
5. Basic intellectual skills	<ul style="list-style-type: none"> <li>▪ The graduate is able to work independently</li> <li>▪ The graduate is able to work systematically and methodically</li> <li>▪ The graduate is able to reflect on the complete scope of Construction Management and Engineering issues, to critically analyse and to generate novel ideas.</li> <li>▪ The graduate is able to invent his own tools, theories and techniques if these are not available</li> </ul>
6. Competent in cooperating and communicating.	<ul style="list-style-type: none"> <li>▪ The graduate is able to work effectively in the context of a multidisciplinary environment, is able to manage complex assignments and can act in different roles depending on the situation, i.e. can take up responsibility as a member and/or as a project leader.</li> <li>▪ The graduate knows the importance of oral and written communication, in particular in English, and can make effective use of these, this means that:               <ul style="list-style-type: none"> <li>○ The graduate is skilled in properly documenting and presenting results of scientific and design work, including the underlying knowledge, choices and considerations, to colleagues and to a broader public.</li> <li>○ The graduate is competent in reasoning</li> <li>○ The graduate adheres to existing academic conventions, such as giving proper credit and referencing.</li> </ul> </li> </ul>
7. Takes account of the temporal and societal context	<ul style="list-style-type: none"> <li>▪ The graduate is able to form an opinion or judgement and contribute to discussions about complex matters related to Construction Management and Engineering</li> <li>▪ The graduate knows that compromises are unavoidable and is able to effectively deal with these.</li> <li>▪ The graduate is aware of the disadvantages for society of certain decisions and can communicate these to the relevant parties (stakeholders). He can take the purpose of the design and its context into consideration.</li> </ul>

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**Appendix 3 – Regular CME programme**

See digital Study Guide, <http://www.studiegids.tudelft.nl/>

For the Tracks, see the CME2000 Graduation Thesis Guideline

## Appendix 4 – Pre-Master’s programme (CME Schakelprogramma)

### Pre-master programma Master CME, TU Delft

Vakcode	Vak	EC	Totaal EC
CT1730HBO	Introduction to Geotechnical Engineering	3	
WI1708TH	Analyse , deel 1, 2 en 3	9	
WI1807TH	Lineaire Algebra	3	
WM0201	Technical Writing	2	
WI1909TH	Differentiaalvergelijkingen	3	
			20
CTB2410	Waterbouw	5	
CTB3420	Integraal ontwerp infrastructuur	4	
WI2031TH	Kansrekening en statistiek voor HBO instromers	3	
CTB3380	Infrastructuur Management	4	
			16
Total premaster CME			36