

# TEACHING AND EXAMINATION REGULATIONS

(TER)

(see sections 7.13 and 7.59 Higher Education and Research Act)

Master's programmes Computer Science and Telematics

Faculty of Electrical Engineering, Mathematics and Computer Science

University of Twente

**The Faculty Dean,**

*in view of sections* 9.15, first subsection, under a, 7.13, first and second subsections, 9.38, subsection b, and 9.18, first subsection, under a, of the Higher Education and Scientific Research Act of the Netherlands,

*having heard* the recommendations of the involved Education Committees, and with due observance of the consent of the involved Faculty Councils

**hereby establishes** Teaching and Examination Regulations for the Computer Science and Telematics programmes

## Remarks

These Teaching and examination regulations for the Master's programmes Computer Science and Telematics are in the format used by the 3TU.O.

Minor adaptations are underlined, or marked by a border line in the left margin (like this paragraph).

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## Section 1 – General

### Article 1 – Definitions

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 thus:

- 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 Dean: Faculty head;
- c. programme the Master's degree programme as denoted in Section 7.3a subsection 1, under b of the Act;
- d. student: anyone enrolled at the University of Twente as a student or external student for the purpose of benefiting from education and/or for the purpose of sitting the interim examinations and undergoing the degree audit which form part of the programme;
- e. subject: a unit of study within the programme as referred to in Section 7.3, subsections 2 and 3 of the Act;
- f. practical: a practical exercise as intended in Section 7.13, subsection 2, under d of the Act, taking one of the following forms:
  - 1. conducting a project or developing an experimental design;
  - 2. completing a design or research assignment;
  - 3. conducting a literature overview;
  - 4. completing a traineeship;
  - 5. giving a public presentation;
  - 6. participating in fieldwork or an excursion;
  - 7. conducting test and experiments;
  - 8. writing a position paper;
  - 9. participating in other educational activities aimed at enabling participants to attain certain knowledge, insights or skills.
- g. interim examination: an assessment of the student's knowledge, insight and skills in relation to a subject, as well as the marking of that assessment by at least one examiner, appointed for that purpose by the Board of Examiners;
- h. degree audit: an assessment by which the Board of Examiners, in accordance with Article 7.10 of the Act, establishes whether all interim examinations in the various subjects that constitute the Master's degree programme have been successfully completed;
- i. Board of Examiners: the programme's Board of Examiners, which has been installed in accordance with Section 7.12 of the Act;

- j. examiner: the individual who, in line with Section 7.12, subsection 3 of the Act, has been appointed to set the interim examinations;
- k. credit: a credit awarded in accordance with the European Credit Transfer System (ECTS); one credit denotes a study load of 28 hours;
- l. working day: Monday to Friday with the exception of recognised national public holidays;
- m. study guide: a guide to the degree programme containing specific information pertaining to the various subjects;
- n. institution: University of Twente;
- o. disability: all conditions which are (at least for the period in question) chronic or lasting in nature and which form a structural limitation for the student in receiving education and/or sitting interim examinations or taking part in practicals.

## Article 2 – Programme composition

1. The following points regarding the programme are included in the programme appendix:
  - a. programme composition and relevant interim examinations,
  - b. whether the programme is full-time, part-time or a sandwich course,
  - c. composition of the specializations,
  - d. study load of the programme and of each of the units of study making up that programme,
  - e. number and sequence of interim examinations and practical exercises,
  - f. whether the interim examinations will be administered in an oral, written or other format,
  - g. the content of the practicals,
  - h. if and when necessary, that a satisfactory result on an interim examination is a prerequisite for admission to other interim examinations,
  - i. if and when necessary, that the requirement to participate in a practical will be part of the admission procedure to a particular interim examination,
  - j. the units of study from which the student may choose to fulfil programme elective requirements,
  - k. the transitional regulations as referred to in article 22.
2. The programme appendix forms an integral part of these regulations.

## Article 3 – The programme’s final attainment levels

1. The final attainment levels of the programme are in line with the Dublin descriptors:
  - a. Knowledge and understanding:  
The graduates have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor’s level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often

- within a research context;
  - b. Application of knowledge and understanding:  
The graduates can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study
  - c. Formulate judgement:  
The graduates have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;
  - d. Communication:  
The graduates can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;
  - e. Learning skills:  
The graduates have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.
2. The final attainment levels are in the programme appendix.

#### **Article 4 – Admission to the programme**

1. Students in possession of a diploma which shows that they have passed the final examination for the *Technische Informatica* (TU/e, TUD, UT), *Telematica* (UT) or *Informatica* (RUG, UU, UvA, VU, UL, RU, OU) Bachelor's programme will be eligible for admission to the programmes.  
In addition, students in possession of a diploma which shows that they have passed the final examination for the *Elektrotechniek* (TU/e, TUD, UT) Bachelor's programme are eligible for admission to the Telematics programme.
2. Students who are not in possession of the diploma mentioned in paragraph 1 will require a certificate of admission issued by the Admissions Board. The Admissions Board is appointed by the Dean with the power to act in matters of admission to the programme.
3. Notwithstanding the provisions of paragraph 1, the Dean may under special circumstances admit a student to one or more interim examinations and/or practicals of the programme before the student has passed the Bachelor's examination. A limited period of validity may be set for such permission.  
This admission to interim examinations and practicals requires explicit permission.  
Permission will not be granted to students without a first year diploma (propedeuse). The permission is limited in the sense that without a Bachelor diploma a student may never take more than 60 EC of the Master's programme.
4. Admission of foreign students:
  - a. The student must submit a proof of sufficient command of English.  
Only the following three tests are accepted: IELTS, TOEFL internet based, and CPE. Scores required for admission are:

IELTS: 6.5 or more;

TOEFL internet based: 90 or more;

CPE: C or higher;

Exemption will be given by the examination board if the applicant provides a proof his or hers previous education on secondary school and bachelor was conducted in english.

- b. 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.
  - c. Level of knowledge: the student must have accumulated sufficient knowledge on the basis of the subjects he/she has studied abroad to be at a level comparable to that of Dutch students who are admitted to the Master's programme.
5. Additional regulations for admission are in the admissions appendix.
  6. The admissions appendix forms an integral part of these regulations.

## **Article 5 – Language**

1. The language of the Master's programme is English. This applies to teaching and examination.
2. The Examination Board can grant permission to conduct interim examination in another language. Permission can be granted only if it serves the quality of the assessment.
3. Students who meet the admission requirements of article 4, but without the English language proficiency corresponding to the IELTS 6.5 level, must take English language courses to overcome their deficiency. The dean issues a regulation concerning the conditions for participation in these courses, and the faculty's contribution in the costs of these courses.
4. The dean issues a regulation concerning the assessment of English language proficiency of staff members who teach courses in the programme, and of the support staff for the programme. All staff involved must meet the language requirements of the regulation. Courses to improve English proficiency of staff members are provided.

## **Section 2 – Interim examinations**

### **Article 6 – Number, times and frequency of interim examinations**

1. There are at least two opportunities in each academic year for sitting interim examinations.
2. A timetable of all opportunities for sitting written interim examinations is drawn up on an annual basis and details are published before the start of the academic year.
3. Notwithstanding the provisions of paragraph 1, there will be at least one opportunity in a year to sit interim examinations relating to subjects not taught in that academic year.
4. If a subject is removed from the study programme, two opportunities to sit an interim examination in this subject will be granted after the last classes in this subject have been

taught: an interim examination following the last of the classes, and one resit in the same academic year. In the following academic year there will be two subsequent resits.

5. In exceptional cases, the Board of Examiners may permit a deviation from the standard number of times and the way in which certain interim examinations may be administered.

### **Article 7 – Validity of interim examinations**

1. The result of an interim examination is valid for an unlimited period.
2. However, in cases where the interim examination result dates from over six years ago, the Board of Examiners may impose an additional or substitute interim examination.

### **Article 8 – Oral interim examinations**

1. Oral interim 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 interim examination.

### **Article 9 – Determining and announcing the results**

1. The examiner is required to determine the result of an oral interim examination as soon as it is finished and to supply the student with a written statement of the result.
2. In the case of written interim examinations, the examiner is required to determine the result as soon as possible after the interim examination but within 15 working days at most. Taking due account of the student's right to privacy, the student administration then ensures that the results are registered and published within 20 working days of the interim examination date. If the examiner is unable to meet these criteria due to extenuating circumstances, the examiner must inform the Board of Examiners, stating reasons for the delay. The Board of Examiners will then pass this information on to the student or students without delay, and a new date for announcing exam results will simultaneously be made known.
3. Regarding any interim examinations that are not taken orally or in writing, the Board of Examiners will determine beforehand precisely how and within what period of time the student will be notified of the results.
4. When receiving the result of an interim examination, the student will be made aware of his or her right to inspect the results as referred to in Article 10, the opportunity for a subsequent discussion as referred to in Article 11 and the opportunity to lodge an appeal with the Examination Appeals Board.

### **Article 10 – The right to inspect the results**

1. For a period of at least 20 working days after notification of the results of any written interim examination, the student has the right to inspect his or her marked work, on request. If a student intends to lodge an appeal regarding the marking of his or her written work, he or she will be supplied with a copy of the marked work at cost price.
2. During the period referred to in paragraph 1, all interested individuals may acquaint

themselves with the questions and assignments set in the interim examination in question, as well as with the criteria used for marking.

3. The Board of Examiners may determine that the right to inspection as referred to in paragraphs 1 and 2 will be exercised at a location specified beforehand and at no less than two specific times, also to be decided in advance.  
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 paragraph 1.  
The location and times mentioned in the first sentence will be announced within five working days.

### **Article 11 – Subsequent discussion of interim examination results**

1. As soon as possible after the results of an oral interim examination have been announced, an opportunity will be arranged for the examiner to discuss the results with the student, if so requested by the student 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 interim examination may submit a request to discuss the results with the relevant examiner. The 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 Board of Examiners, a student may only submit a request, as referred to in the preceding paragraph, if the student was present at the collective discussion and if the student provides a good reason for the request or if, due to circumstances beyond the student's control, the student was unable to attend the collective discussion.
4. The provisions of paragraph 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 deviations from the provisions of paragraphs 2 and 3.

## **Section 3 – Studying with a disability**

### **Article 12 – Adaptations to assist students with a disability**

1. Students who have a physical or sensory disability are entitled to adaptations in teaching, interim examinations and practicals. If possible, the student must submit a written request to the Dean at least three months before the student is due to participate in coursework, interim examinations and/or practicals. These adaptations 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 subject or an interim examination programme. The facilities provided to this end may involve adapting the form or duration of interim examinations and/or practicals to



the student's individual situation or making practical aids available. This request should be submitted to either a university student counsellor or the faculty student counsellor.

2. The request referred to in paragraph 1 should be accompanied by a recent medical certificate from a doctor or a psychologist. If there is evidence of dyslexia, for example, the request should be accompanied by a document issued by a recognised dyslexia-testing bureau (i.e. registered with BIG, NIB, or NVO). If possible, this certificate should also give an estimation of the extent of the disability.
3. The Dean will decide on requests for adaptations to the educational environment. The Board of Examiners will decide on requests for adapting interim examinations. The decision must be announced within four weeks.

## Section 4 – Approval by the Board of Examiners

### Article 13 – Exemption from interim examinations or practicals

1. After having been advised by the relevant examiner, the Board of Examiners may decide to exempt students from an interim examination or practical. Conditions for exemption are to be specified in the Rules and Regulations of the Board of Examiners.
2. The Board of Examiners may exempt a student from a specific interim examination only on the grounds of the content, level and quality of interim examinations successfully completed earlier or on the grounds of the student's prior knowledge, insights and skills developed outside of higher education.
3. Exemptions as referred to in Articles 13.1 and 13.2 can not be granted on the basis of results from the Bachelor's programme, the diploma of which made the student eligible for admission.

### Article 14 – Elective subjects

Criteria for approval of elective subjects to be followed by the student, as referred to in the programme appendix under i, are contained in the Rules and Regulations of the Board of Examiners.

### Article 15 – Free programme choice

The Board of Examiners shall decide on reasoned requests from students for free programme choice as referred to in Article 7.3c of the Act. Conditions related to this matter are to be specified in the Rules and Regulations of the Board of Examiners.

## Section 5 – Degree audit

### **Article 16 – The times and the frequency of the degree audit**

There shall be an opportunity to undergo the Master’s degree audit at least twice a year. The dates set by the Board of Examiners are to be published before the start of the academic year.

### **Article 17 – Student support and guidance**

Responsibility for student support and guidance lies with the Dean. This includes informing students about study options within the programme or elsewhere. One or more study advisers may be appointed for this purpose.

### **Article 18 – Monitoring academic progress**

1. The Dean is responsible for the registration and timely publication of the exam results of individual students in the institution’s virtual learning system.
2. The Dean is responsible for facilitating discussion of the results between the student and the study adviser, when appropriate.

## Section 5 – Appeals and objections

### **Article 19**

1. Decisions by the Board of Examiners based on these regulations may be appealed within four weeks after the announcement of the decision to the student in question. Appeals should be lodged with the Examination Appeals Board.
2. Decisions by the Dean based on these regulations may be appealed within six weeks after the announcement of the decision to the student in question. Objections are to be lodged with the Dean.

## Section 6 – Contravention, changes and implementation

### **Article 20 – Contravening the regulations**

If the study guide and/or any other regulations relating to the study programme and/or the interim examination programme prove to contravene these Regulations and the accompanying appendices, precedence will be given to the provisions of these Regulations with which the appendices form an integral whole.

### **Article 21 – Amendments to the regulations**

1. Any amendments to these regulations will be made by special resolution of the Dean.

2. No amendments will affect the current academic year unless it is reasonable to suppose that the interests of students will not be adversely affected.
3. Amendments to these regulations may not retroactively affect a decision by the Board of Examiners to the detriment of the student.

### **Article 22 – Transitional arrangements**

1. If the composition of the study programme undergoes intrinsic changes or if these regulations are amended, the Dean will draw up transitional regulations that will be incorporated in the programme appendix of these Regulations.
2. If and when appropriate, such transitional regulations are required to include:
  - a. a provision concerning the exemptions that can be given on the basis of the interim examinations already passed;
  - b. a provision specifying the validity of the transitional regulations.

### **Article 23 – Publication of the regulations**

The Teaching and Examination Regulations and the appendices, which form an integral whole with the Regulations, shall be published on the institution's website.

### **Article 24 – Entry into force**

These regulations will come into effect on September 1, 2010.

## Programme appendix to the Teaching and Examination Regulations of the Master's programmes Computer Science and Telematics

The regulations in this appendix are part of the teaching and examination regulations of the master's programmes Computer Science and Telematics of the Faculty of Electrical Engineering, Mathematics and Computer Science of the University of Twente.

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### a. Study load

1. The Master's degree audit for the Computer Science and Telematics programmes has a study load of 120 credits. These 120 credits must not include any credits which constituted part of a previously passed Bachelor's audit.
2. The programmes will be taught in full-time.

### b. Composition of the programme

1. The composition of the course programmes is as follows:
  - a. Basic subjects, 20-36 credits, as described in section c,
  - b. Advanced subjects, 18-30 credits, as described in section d,
  - c. Elective subjects, 20-45 credits, as described in section e,
  - d. Computer Ethics, 5 credits, course unit 191612680
  - d. (Research) traineeship Research topics, 15-30 credits, as described in section f,
  - e. Graduation work, 30 credits, as described in section g.
2. Each student has an individual course programme which meets the programme requirements set in sections b, c, d, e, f and g, and also the general guidelines of section i of this appendix. Requirements vary according to
  - a. the Master programme the student is enrolled in (Computer Science or Telematics);

- b. the admission of the student to graduate school programme (applies only to CS students);
- c. the choice of a track by the student (applies only to CS students who are not in a graduate school programme).

Details of these options are in section b sub 3 below.

3. For the composition of the course programmes this teaching and examination regulation distinguishes between 11 specializations, which are:
  1. Computer Security or Kerckhoffs (CS) Master: a Computer Science (M-CS) specialization in Computer Security. (The course programme is organized by the Kerckhoffs Institute, a cooperation of the University of Twente with the Technical University of Eindhoven and the Radboud University at Nijmegen)
  2. Embedded Computing Systems (ECS) track . a Computer Science (M-CS) specialization in embedded systems and/or hardware/software codesign. This specialization will be discontinued and cannot be entered after September 1 2010.
  3. Information Systems Engineering (ISE) track: a Computer Science (M-CS) specialization in information systems engineering.
  4. Methods and Tools for Verification (MTV) track: a Computer Science (M-CS) specialization in methods and tools for verification.
  5. Software Engineering (SE) track: a Computer Science (M-CS) specialization in software engineering.
  6. Dependable and Secure Computing (DeSC) graduate school programme: this specialization is the Computer Science (M-CS) Master part of the graduate school programme on dependable and secure computing.
  7. Service Sciences (SeSci) graduate school programme: this specialization is the Computer Science (M-CS) Master part of the graduate school programme on services sciences.
  8. Wireless and Sensor systems (WiSe) graduate school programme: this specialization is the Computer Science (M-CS) Master part of the graduate school programme on wireless and sensor systems.
  9. Wireless and Sensor systems (WiSe-t) track: a Computer Science (M-CS) specialization on wireless and sensor systems. The programme is the Master part of the WiSe graduate school programme, that can be followed as a track (so independent from the graduate school).
  10. Human-Centered Interaction Technologies (HCIT) graduate school programme: this specialization is the Computer Science (M-CS) Master part of the graduate school programme on interactions between humans and ICT (the programme is an instance of the ISE track programme).
  11. Telematics (M-TEL) Master: an independently accredited Master programme on Telematics.
4. The regulations for the choice of a specialization by the student (when applicable), and for the approval of the student's course programme (within the rules and restrictions of the

programme, as outlined in this appendix) are in section h of this appendix.

The Examination Board appoints programme mentors to advise students in their choices.

Programme mentors will have the authority to approve student's programmes on behalf of the Examination Board.

5. In addition to the programme referred to in paragraph 1, students who will be admitted to the programme on the basis of a Bachelor's degree awarded by a Dutch institute of professional education (HBO) must also complete a pre-Master's programme. See the description in the admissions appendix.
6. The admissions board may issue certificates of admission with additional requirements (see the description in de the admissions appendix). These additional requirements are generally called homologation courses. The obligation to take homologation courses will diminish the space the student has to take elective subjects and/or a traineeship.
7. The admissions board may issue certificates of admission with a requirements waiver. This may be the case if the student has taken relevant subjects already in his or her Bachelor's programme (see the admissions appendix). A requirements waiver increases the space the student has to take elective subjects.
8. The requirements presented in sections c through g below are modified where necessary and adopted each year by the Dean. If changes are made, a transitional arrangement is made for students (cohorts) further along in the programme, enabling them to complete their course of study in accordance with the rules. The transitional arrangements are in section n of this appendix.

### **c. Basic subjects**

1. Students must complete the basic subjects programme of their programme and specialization (see section b under 3 above). The total study load of the basic requirements is in the range of 25-36 EC, depending on the type.
2. For Computer security (Kerckhoffs) students the locations where the subjects are offered are shown in the course name. UT is the University of Twente (at Enschede), TU/e is the Technical University of Eindhoven, and RU is the Radboud University (at Nijmegen).
3. Courses marked with (\*) are excluded from the provisions of article 4 under 3 of the Teaching and Examination Regulations. Students must have a Bachelor's diploma and (or) a certificate of admission to sit the interim examination.
4. An additional recommendation applies to the Embedded Computing Systems options. The 11 units are in three different categories: Mathematics (191560810 Signals and transformations, 191560561 Introduction to mathematical systems theory, 191520751 Graph theory, 191511410 Algebra and security), Design oriented (192130122 Hardware/software co-design, 192140122 System validation, 192170015 Testing techniques, 192620300 Performance evaluation 1), and Domain oriented (192111301 Ubiquitous computing, 192620000 Telematics networks, 191210341 Physical systems modelling of embedded systems). It is strongly recommended that a course programme has units in each of these categories.

#### **d. Advanced subjects**

1. Students must complete the advanced subjects programme of their programme and specialization (see section b under 3 above. The total study load of the basic requirements is in the range of 18-30 EC, depending on the type.
3. For Computer security (Kerckhoffs) students the locations where the subjects are offered are shown in the course name. UT is the University of Twente (at Enschede), TU/e is the Technical University of Eindhoven, and RU is the Radboud University (at Nijmegen).
4. Courses marked with (\*) are excluded from the provisions of article 4 under 3 of the Teaching and Examination Regulations. Students must have a Bachelor's diploma and (or) a certificate of admission to sit the interim examination.
5. Kerckhoffs students choose three courses from a list of 9 options.
6. Methods and tools for verification students choose courses from two groups of options for their advanced subjects programme. They take 3 course from the 4 options in the one group and one course from the 6 options in the other group.
7. Other students (not Kerckhoffs, nor GS, nor MTV) choose courses from a group of options to a minimum study load of 20-25 EC.
8. ISE students cannot take 192110860 XML & databases 2 as an advanced course without taking 192110961 XML & databases 1, **and conversely**. An ISE student cannot take 192110890 Sensor data management 2 as an advanced course without taking 192110880 Sensor data management 1, **and conversely**. The choice for 192110961 XML & databases 1 as a basic subject, excludes the choice for the pair 192110961 XML & databases 1 and 192110860 XML & databases 2 as advanced subject. The corresponding rule also applies to the Sensor data management courses.
9. SE students cannot take 192135450 ADSA Model driven engineering as an advanced course without taking 192135400 ADSA Product line engineering, **and conversely**. An SE student cannot take 192135320 Modelling and analysis of concurrent systems 2 as an advanced course without taking 192140122 System validation as a basic subject.

#### **e. Elective subjects and homologation courses**

Elective subjects are chosen upon advice of the programme mentor. There are no formal rules limiting the choice of these subjects, except that approval of the choice of subjects by the programme mentor on behalf of the Examination Board is required.

See also section i.

In some cases the admissions board may issue a certificate of admission with additional requirements. See the admissions appendix. Generally the student will use the space for elective subjects in his or her course programme to meet these additional requirements, usually called 'homologation'. Consequently he or she can take less or no elective subjects.

## **f. (Research) Traineeship, research topics**

1. Graduate school students must take a 15 EC international research orientation/internship in their course programme.
2. All students except the graduate school students **may** take a 20 EC traineeship in their course programme. A student who must take homologation (see section e) courses can skip a traineeship to make space for the homologation.
3. All students, except the graduate school students **must** take a 10 EC Research topics subject in their course programme. The regulation of Article 4 under 3 does not apply to the Research topics.
4. Students may start a traineeship only if they have passed the Bachelor's audit referred to in Article 4 paragraph 1 of the Teaching and Examination Regulations. The regulation of Article 4 paragraph 3 does not apply to the traineeship.

## **g. Graduation Work**

1. Students complete graduation work worth 30 credits.
2. Graduation work consists of a graduation project, a graduation report, a summary of the report, and a presentation. Generally the Research topics of section f above immediately precede the graduation work, and serve as a preparation for the graduation work.
3. Students may start graduation work only if they have completed all of the remaining components of the study programme. The regulation of Article 4 under 3 does not apply to the graduation project.

4. Faculty chairs take responsibility for supervision and assessment of graduation work. The division of responsibilities is as follows:

Computer security (Kerckhoff):	DIES
Embedded computing systems:	CAES or PS
Information systems engineering:	IS or DB
Methods and tools for verification:	FMT
Software engineering students:	SE or FMT
Dependable and Secure Computing:	DACS, DIES, FMT or SE
Services science:	DB, IS or SE
Wireless and sensor systems:	PS, CAES or DACS
Human-centered interaction technologies:	HMI or DB
Telematics:	DACS

## **h. Course programmes**

### **1. MSc Computer Science Specialization Computer Security**

six basic subjects of 6 credits each:

192194100 -	Cryptography 1 (TU/e)
192195200 -	Security in organisations (RU)



- 192195100 - Software security (RU)
- 192194200 - Verification of security protocols (TU/e)
- 192150101 - Introduction to computer security (UT)
- 201000086 - Network security for Kerckhoffs students (UT)

at least three of the following nine advanced subjects of 6 credits each:

- 191210901 - Introduction to Biometrics (UT)
- 192110941 - Secure data management (UT)
- 192195400 - Seminar (Privacy) (RU)
- 192194110 - Cryptography 2 (TU/e)
- 192195300 - Hardware and operating systems security (RU)
- 192195500 - Law in cyberspace (RU)
- 192194300 - Linux kernel and hacker's hut (TU/e)
- 192194400 - Seminar information security technology (TU/e)
- 201000207 - Security of Information Services

elective subjects:

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations.

mandatory (45 EC):

- 191612680 - Computer Ethics (5 EC)
- 192199508 - Research Topics (10 EC)
- 192199978 - Final Project (30 EC)

## **2. MSc Computer Science Specialization Embedded Computing Systems**

3 basic subjects:

- 191210001 - Instrumentation for embedded systems
- 192130022 - Design of digital systems
- 192130112 - Distributed systems

at least 3 of the following 11 basic subjects:

- 191210341 - Physical systems modelling of embedded systems
- 191511390 - Algebra
- 191520751 - Graph Theory
- 191560561 - Introduction to mathematical system theory
- 191560810 - Signals and transformations or Signalen en systemen (191561800)
- 192111301 - Ubiquitous computing
- 192130122 - Energy-efficient Embedded Systems
- 192140122 - System Validation
- 192170015 - Testing Techniques
- 192620000 - Telematics networks
- 192620300 - Performance evaluation

At least 20 ECTS of the following advanced subjects:

- 191210441 - Control Engineering
  - 191210590 - Embedded signal processing
  - 192111332 - Design of software architectures
  - 192130092 - Faulttolerant digital systems
  - 192130200/192130210 - Real-time systems 1/2
  - 192130240/192130250 - Embedded computer architectures 1/2
  - 192135310/192135320 - Modelling and analysis of concurrent systems 1/2
  - 192620010 /192620020 - Mobile & Wireless Networking 1/2
  - 192111233 - Aspect oriented programming
  - 191210940 - Advanced Digital signal Processing
  - 191210770 - Digital control engineering
  - 191211070 - Intelligent control
  - 191211320 - Testable Design and Test of Integrated systems
- and
- 192199968 - traineeship (except for HBO students who have to choose at least 20 ECTS more from courses listed above)

elective subjects:

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations.

mandatory (45 EC):

- 191612680 - Computer Ethics (5 EC)
- 192199508 - Research Topics (10 EC)
- 192199978 - Final Project (30 EC)

### **3. MSc Computer Science Specialization Information Systems Engineering (incl. Human-centered interaction technologies)**

4 basic subjects:

- 192110902 - Advanced Database systems
- 192110982 - Database transactions and processes
- 192320111 - Architecture of information systems
- 192320820 - Design science methodology

at least one of the following 9 basic subjects:

- 192110720 - Distributed data processing using MapReduce
- 192110880 - Sensor Data Management 1
- 192110940 - Secure Data management
- 192110961 - XML & Databases 1
- 201000207 - Security of Information Services
- 192320501 - Electronic Commerce

- 192320850 - Advanced requirements engineering (start module)
- 192330301 - Specification of information systems
- 192652150 - Service-oriented architecture with web services

at least 20 ECTS of the following advanced subjects:

- 192110961/192110860 - XML & databases 1/2
- 192110880/192110890 - Sensor data management 1/2
- 192160400 - Information retrieval
- 192320220 - Advanced architecture of information systems
- 192320850 - Advanced requirements engineering (follow up modules)

elective subjects:

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations.

mandatory (45 EC):

- 191612680 - Computer Ethics (5 EC)
- 192199508 - Research Topics (10 EC)
- 192199978 - Final Project (30 EC)

#### **4. MSc Computer Science Specialization Methods and Tools Verification**

4 basic subjects:

- 192111092 - Advanced Logic
- 192135310 - Modelling and Analysis of Concurrent Systems 1
- 192140122 - System Validation
- 192170015 - Testing Techniques

at least 3 of the following 10 basic subjects:

- 191511410 - Algebra & Security
- 191520751 - Graph Theory
- 191560561 - Introduction to mathematical systems theory
- 191580752 - Deterministic models in OR
- 192111233 - Aspect oriented Programming
- 192111332 - Design of Software Architectures
- 192120100 - Introduction to Computer Security
- 192620300 - Performance evaluation 1
- 192130092 - Faulttolerant digital systems
- 192130500 - Performance Analysis

at least 3 of the following advanced subjects:

- 192114100 - Principles of Model Checking
- 192114200 - Quantitative modeling and analysis

192114300 - Program Verification  
192135320 - Modelling and Analysis of Concurrent Systems 2

at least one of the following advanced subjects:

191210441 - Control engineering  
192111700 - Computability and Computational Complexity  
192135450 - ADSA- Model driven engineering  
192140700 - The numbers tell the tale (meten=weten)  
192661001 - Patterns of software development

elective subjects:

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations.

mandatory (45 EC):

191612680 - Computer Ethics (5 EC)  
192199508 - Research Topics (10 EC)  
192199978 - Final Project (30 EC)

## **5. MSc Computer Science Specialization Software Engineering**

basic subject:

192340041 - Software management

at least 25 ECTS of the following basic subjects:

191511390 - Algebra  
191520751 - Graph theory  
191580752 - Deterministic models in OR  
192111092 - Advanced logic  
192111233 - Aspect oriented programming  
192111332 - Design of software architectures  
192140122 - System Validation  
192170015 - Testing Techniques  
192320820 - Design science methodology  
192330301 - Specification of information systems

at least 20 ECTS of the following advanced subjects:

192110280 - Advanced programming concepts  
192135310 - Modelling and analysis of concurrent systems 1  
192135320 - Modelling and analysis of concurrent systems 2  
192135400 - ADSA-Product Line Engineering  
192135450 - ADSA-Model Driven Engineering  
192320850 - Advanced requirements engineering

elective subjects

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations.

mandatory (45 EC):

- 191612680 - Computer Ethics (5 EC)
- 192199508 - Research Topics (10 EC)
- 192199978 - Final Project (30 EC)

**6. MSc Computer Science Specialization Dependable and Secure Computing**

Compulsory core courses (25 EC):

- 192130500 - Performance Analysis
- 192140122 - System Validation
- 192150100 - Introduction to Computer Security
- 192111332 - Design of Software Architectures
- 191210441 - Control Engineering

and depending on choice of track (30 EC):

***Track Dependability Modeling and Evaluation (DME):***

- 192620300 - Performance Evaluation 1
- 192135310 - Modeling and Analysis of Concurrent Systems 1
- 192135320 - Modeling and Analysis of Concurrent Systems 2
- 192114200 - Quantitative Modeling and Analysis
- 192135450 - ADSA Model Driven Engineering
- 191580752 - Deterministic Models in OR

***Track Secure Networks (SN):***

- 192654000 - Network Security
- 192110941 - Secure Data Management
- 192620010 - Mobile and Wireless Networking 1
- 192114300 - Program Verification
- 192194100 - Cryptography 1 (TU/e)
- 192194200 - Verification of Security Protocols (TU/e)

***Track Dependable Software Synthesis (DSS):***

- 192661001 - Patterns of Software Development
- 192111233 - Aspect Oriented Programming
- 192170015 - Testing Techniques
- 192135450 - ADSA Model Driven Engineering
- 192114300 - Program Verification

192135310 - Modeling and Analysis of Concurrent Systems 1

Elective courses :

These consist of:

- courses in the other tracks of “Dependable and Secure Computing”
- courses from the following list
- other courses in consultation with the programme mentor

Listed courses:

192111092 - Advanced Logic (FMT)  
192110280 - Advanced Programming Concepts (SE)  
191511390 - Algebra (DMMP)  
192111700 - Computability and Computational complexity (HMI)  
192130112 - Distributed systems (PS)  
191520751 - Graph Theory (DMMP)  
192653100 - Internet Management and Measurement (DACS)  
191210900 - Introduction to Biometrics (SAS)  
191560561 - Introduction to Mathematical Systems Theory (MSCT)  
192140700 - The Numbers tell the Tale (meten = weten)  
192620020 - Mobile and Wireless Networking 2 (DACS)  
191210341 - Physical Systems modeling of Embedded Systems (CE)  
191211090 - Real-Time Software Development (EL)  
192620000 - Telematics Networks (DACS)  
191211080 - Systems Engineering (EL)  
192620300 - Performance Evaluation 1

mandatory (55 EC):

- Individual Specialization Assignment for Track A, B, or C (5 EC)
- 191612680 Computer Ethics
- International Research Orientation/Internship (15 EC)
- Master Thesis (including Research Proposal) (30 EC)

**7. MSc Computer Science Specialization Service Sciences**

Four compulsory courses:

192320111 - Architecture of Information Systems  
192110902 - Advanced Database Systems  
192320501 - Electronic Commerce  
192111332 - Design of Software Architecture

Five courses in Track A: Services technologies:

192652150 - Service-Oriented Architecture with Web Services  
192110982 - Database Transactions and Processes  
192330301 - Specification of Information Systems

192320550 - XML- Technology  
192135450 - ADSA- Model Driven Engineering

Five courses in Track B: Services in business:

192376500 - Business Process Integration Lab  
193160060 - Information & Knowledge Exchange Services  
194108040 - Business Development in Networks  
192320201 - Data Warehousing & Data Mining  
192320820 - Design Science Methodology

Four elective courses:

- a. Compulsory courses from the other track.
- b. Courses from the following list:

192320220 - Advanced Architecture of Information Systems  
192320850 - Advanced Requirements Engineering  
192376000 - Business Case Development for IT-projects  
192340070 - Computer Supported Cooperative Work  
192404600 - E-Government: communication and organization  
192350200 - E-Strategizing  
192360021 - ICT Management  
192340101 - Implementation of IT in Organizations  
194105070 - Information Systems for the Financial Services Industry  
193163010 - Information and Knowledge Management  
191863970 - Information Systems Design Methodologies  
192652110 - Java Middleware Technologies  
192160200 - Knowledge Representation  
193190000 - Managing Service Organizations  
192631000 - Mobile E-health Applications and Services  
191852640 - Production & Logistics Information Systems  
192150300 - Security of Information Services  
192330301 - Specification of Information Systems  
195810200 - Supply Chain Management & ICT  
192140122 - System Validation  
192110961 - XML & Databases 1

mandatory (55 EC):

- Individual specialization assignment for Track A or B (5 EC)
- 191612680 Computer Ethics (5 EC)
- International research orientation/internship (15 EC)
- Master thesis (including research proposal) (30 EC)

## **8/9. MSc Computer Science Specialization Wireless and Sensor Systems**

### Four compulsory core courses (25 EC):

192620010 -	Mobile and Wireless Networking I (DACS 5 EC)
201000075-	Wireless Sensor Networks (PS 5EC)
191210750 -	System-on-Chip Design (CAES/ICD 10EC)
191211030 -	Mobile Radio Communications (TE/SRR 5EC)

### Six courses (30 EC) that all belong to one of the three tracks.

- Flexible and efficient communication
- Distributed wireless systems
- Distributed data processing and reasoning

### elective courses (10 EC):

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations in masterprogramme's of Computer Science, Electrical Engineering, Telematics and Embedded Systems.

### mandatory (55 EC):

- 191612680 Computer Ethics (5 EC)
- International research orientation or internship (20 EC)
- Research proposal/master thesis (30 EC)

## **10. MSc Computer Science Specialization Human-centered interaction technologies is included in 3.**

## **11. Master of Science Telematics**

### basic subjects (35 ECTS):

192140122 -	System validation
192620010 -	Mobile and wireless networking 1
192620250 -	Selected topics in P2P systems
192620300 -	Performance evaluation
192652150 -	Service oriented architecture with web services
192653100 -	Internet management and measurement
192654000 -	Network security

### at least 4 of the following 18 advanced subjects:

191210780 -	Modern Communication Systems
191211030 -	Mobile radio communications
191211710 -	Core networks
192110880 -	Sensor data management 1
192111301 -	Ubiquitous computing
192135450 -	ADSA Model Driven Engineering



192140700 -	The numbers tell the tale (meten = weten)
192195200 -	Security in organisations
192170015 -	Testing techniques
191210800 -	Information Theory
192320111 -	Architecture of information services
192320550 -	XML- Technology
192620020 -	Mobile and wireless networking 2
192631000 -	Mobile e-health applications and services
192653000 -	Management of networked applications
192661001 -	Patterns of software development
192640020 -	Business process engineering
192194300 -	Linux kernel and hacker's hut

elective subjects:

Other subjects to obtain the minimally required number of 120 credits may be chosen from the subjects offered by other specializations.

mandatory (45 EC):

191612680 -	Computer Ethics (5 EC)
192199508 -	Research Topics (10 EC)
192199978 -	Final Project (30 EC)

## **i. Course programme approval**

### **Approval procedures**

The student must complete the following steps to obtain course programme approval:

1. Orientation

Students complete subjects and sit interim examinations as they see fit. In this phase only a few credits can be earned. During this phase, the student can be advised by the admissions board or, if the choice of track is clear, by a programme mentor (see section b under 3). If the student chooses subjects or projects during orientation without consultation of the admissions board or a programme mentor, he/she does so at his/her own risk.

If 15 credits have been earned in de Master's Programme, the orientation ends. At this point, permission from a study adviser is required for a more complete programme of at least one year. Phase 2 begins.

In case the student during orientation chooses only subjects and projects which are mandatory for any course programme (within a given graduation subject field or track), consultation with and approval by a programme mentor may be postponed to a maximum of 30 credits. No one can earn more than 30 credits in phase 1.

2. Approval of initial choices  
After receiving approval from the programme mentor, at least 60 credits of the course programme to be completed or already partially completed are laid down. The choice of graduation subject field or track is clear, as is the matter of whether a traineeship will be included in the course programme. The manner in which the credits for optional units of study are to be allocated and the chair/chairs from which the student will graduate may still be not entirely clear.
3. Approval of entire course programme  
The programme mentor approves the 120-credit course programme in its entirety. At this point it is clear which chair/chairs will bear responsibility for the student's graduation supervision.

Students may reduce the term of Phase 1 and skip Phase 2. Regardless of how the student wishes to proceed, once the limit established for the orientation phase has been reached (i.e. 15 programme credits earned or 30 credits for mandatory units of study only), the study adviser must be contacted.

### **Laying down and obtaining approval of course programmes**

Standard forms for laying down the course programme are available from the Educational support office secretariat and on the website of the Faculty of EEMCS.

Once the programme and student reach an agreement on the content of the course programme, they complete and sign the forms. The programme mentor signs on behalf of the Examination Board.

The completed and signed form listing the course programme must be included in the student's file at S&O (the Student & Education service centre).

In principle, the student will earn the programme diploma if he/she completes the units of study listed in the course programme and earns results in line with the guidelines for passing the final assessment.

If the course programme listed on a signed form does not satisfy the regulations described in this programme appendix and/or does not satisfy the conditions imposed by the admissions board, the Examination Board is authorised to impose additional diploma eligibility requirements.

### **General guidelines for the composition of course programmes**

There are six general rules to be observed by the student and study adviser in assessing the student's possible course programme choices and in signing the finalized course programme. These general rules work differently according to programme, graduation subject field and track. See also sections b-g of this appendix

1. The student creates a programme of units of study totalling 120 credits. These units are selected from among the courses offered by the UT or, where beneficial, courses offered by other universities. All course programmes except for graduate school students **have to include Computer Ethics (191612680, 5 credits), a 30-credit graduation assignment, and a 10-credit research project.** Graduate school students have to include Computer Ethics

**(191612680, 5 credits), a 15 credit international research orientation/internship and a 30 credit graduation assignment.** The Examination Board may grant a student (not a graduate school student) exemption from the mandatory 5 credits Computer Ethics and/or the 10 credits research project.

2. The admissions board may grant a student admission with additional requirements, imposing additional diploma eligibility requirements. These requirements differ from student to student. No more than 30 credits will be required to satisfy the conditions imposed by the admissions board.

The Master's programme final assessment cannot be passed if the course programme of this category of students does not satisfy the additional requirements imposed. There are no exceptions to this rule.

3. Requirements apply to each course programme to ensure basic knowledge in the field of study and the track selected. The admissions board may adjust these requirements on the basis of the student's prior education and training. Such an adjustment will never entail an intensification of the requirements. The Master's programme final assessment cannot be passed if the course programme does not satisfy the basic knowledge requirements. The only exception to this rule is when the admissions board lowers the basic knowledge requirements.
4. Requirements apply to each course programme to ensure sufficient depth of study in the track selected. The manner in which these requirements are satisfied is determined in consultation with the study adviser. This includes, where necessary, taking into account which chair/chairs will bear responsibility for the student's graduation supervision. The Master's programme final assessment cannot be passed if the course programme does not satisfy the depth of study requirements. There are no exceptions to this rule.
5. Requirements apply to some course programmes governing the chair from which the student can complete his/her studies, according to the graduation subject field or track selected. The Master's programme final assessment cannot be passed if, during the course of study, the requirements for the composition of the graduation committee are not satisfied. There are no exceptions to this rule.
6. One guideline applicable to all course programmes is that continuing students (i.e. holders of a UT Bachelor's diploma eligible for automatic admission to one of the Master's programmes) complete part of the programme's 120 credits **outside** of the UT. The Examination Board may decide to exempt an individual from this guideline.

The total number of credits completed **at the UT or at another university or research institute approved by the study adviser, must be at least 90.** The Examination Board may permit a student to deviate from this rule. Additional requirements with regard to the type of activities completed by students outside of the UT may be posed. For instance, the obligation that a student complete a traineeship. Such a requirement must involve no more than 30 credits. The Master's programme final assessment cannot be passed if the course programme does not satisfy the requirements imposed with regard to the units of study completed outside of the UT, unless an exemption has been granted.

## **j. Free programme**

1. Students can compile their own programme, with an associated degree audit. The programme requires prior approval by the Board of Examiners. The Board of Examiners draws up a regulation for approval of free programmes.
2. When applying to the Board of Examiners for the prior approval referred to in paragraph 1, students must provide details of their reasons for making this request.

## **k. Organisation of practicals**

There are no specific regulations for the organisation of practicals.

## **l. The order of and the conditions for admission to units of study, interim examinations and practicals.**

To participate in a unit of study the student it is mandatory for a student to register as a participant. Registration is possible in the periods published in the rosters. To sit (interim) examinations, registration is mandatory also. Periods for registration are published in the roster. Admission to units of study and interim examinations can be denied to students who did not register.

Additional conditions of admission to the units of study and to interim examinations are in sections f (for traineeship) and g (for graduation work).

## **m. The final attainment levels of the programmes**

1. The degree programmes have the following general scientific attainment levels
  - a. Graduates have an extensive knowledge of and understand the issues relevant to their specific field of study (i.e. programme-specific attainment targets) described in section l of this appendix under 2 below.
  - b. Graduates can contribute to scientific research, and independently design, conduct and present the results of small-scale research.
  - c. Graduates can provide an original contribution to the development and/or application of the field of study.
  - d. Graduates can analyse complex problems (change problems) relevant to the field of study and obtain the required knowledge and information.
  - e. Graduates can design, validate and implement solutions/systems in their operational context; identify and apply relevant advanced knowledge, methods and techniques from their field of study.
  - f. Graduates can assess solutions/systems and their applications according to their properties and potential to solve problems even if they are new to or unfamiliar with the situation or lack information and/or reliable information; they can use their assessment as a basis for (substantiation of) decisions.
  - g. Graduates understand the ethical, social, cultural and public aspects of problems and solutions in their field of study; apply this insight in their international role as scholar.
  - h. Graduates can work as part of and play a leading role in a team; manage and plan a development process; document development and research processes.

- i. Graduates can substantiate research results, designs and applications in writing and verbally; critically assess and participate in debates regarding the same.
- j. Graduates can independently acquire new knowledge and skills; reflect on trends in their field of study, responsibilities and roles and use this insight as a guide for and integrate it into their own personal development.
- k. Graduates can integrate information from other disciplines into their own work if necessary.
- l. Graduates take a critical approach to reading, incorporating information presented in and participating in debates regarding international scientific literature relevant to their field of study.

The word 'original' in 1c is understood to mean 'demonstrative of a creative contribution', and not 'pioneering'.

## n. Assessment and marking

Tables 3 show how assessments for the units of study are organised.

The 'Assessment method' columns use the following codes:

S	written interim examination
O	written assignment: detailed exercises, a report, an essay or other written document reviewed and assessed by the examiner, but not in the presence of the student
M	oral assessment: a meeting involving the student and the examiner or other individual, during which the student's knowledge is assessed
P	practical assignment: a functioning product prepared and submitted by the student to be assessed in terms of behaviour, operation and/or use (e.g. a simple programme or a larger, functioning prototype)
Pj	project: group activities as part of which the resulting group work and the student's participation are assessed
Pre	presentation: information presented by the student before an audience, usually other students

These codes are used to give a general indication of the assessment method of each unit of study, not outline the exact rules governing the form of assessment.

### Table 3

The phrase *Not for "interwoven students"* indicates that the unit is excluded from the provisions of article 4 under 3 of the Teaching and Examination Regulations. Students must have a Bachelor's diploma and (or) a certificate of admission to sit the interim examination. The numbers in the Prerequisites column are explained at the end of the table.

Course	Study load	Assessment	Pre-requisites	Additional regulations
191210001 Instrumentation for embedded systems	5	S		
191210341 Physical systems modelling of embedded systems	5	S		
191210441 Control engineering	5	S or O		
191210590 Embedded signal processing.	5	S, P, Pj		
191210780 Transmission systems	5	O, Pre	1	
191210900 Introduction to biometrics (UT)	5	O		
191211030 Mobile radio communication	5	O, Pre		
191211710 Core networks	5	S, O, Pre		
191511390 Algebra	5	S, O		
191520751 Graph theory	5	S		
191560561 Introduction to mathematical system theory	5	S, P, O		
191560810 Signals and transformations	5	S		
191580752 Deterministic models in OR	5	S		
192130092 Fault tolerant Digital Systems	5	S		
192110280 Advanced programming concepts	5	S, O, Pre		Not for "interwoven students"
192110720 Distributed data processing using MapReduce	5	O		
192110941 Secure Data Management	6	S, O		

192110860 XML & databases 2	5	O	To have 192110860 in his course programme, the student must also take 192110961
192110880 Sensor Data Management 1	5	S, O	
192110890 Sensor data management 2	5	Pj	To have 192110890 in his course programme, the student must also take 192110880
192110902 Advanced database systems	5	S, P	
192110940 Secure data management	5	S, O	
192110961 XML & Databases 1	5	S, O	
192110982 Database transactions and processes	5	S, O	
192111092 Advanced logic	5	S, O	
192111233 Aspect oriented programming	5	O, P	
192111301 Ubiquitous computing	5	O, Pre	Not for "interwoven students"
192111332 Design of software architectures	5	S, O	
192111700 Computability and computational complexity	5	S	
192114100 Principles of model checking	5	S	Not for "interwoven students"
192114200 Quantitative modelling and analysis	5	O	
192114300 Program verification	5	S, O	
192130022 Design of digital systems	5	Pj	
192130092 Faulttolerant digital systems	5	S	Not for "interwoven students"

192130112 Distributed systems	5	S	Not for “interwoven students”
192130122 Energy- efficient Embedded Systems	5	O, Pre	
192130200 Real-time systems 1	5	S	Not for “interwoven students”
192130210 Real-time systems 2	5	S, O	Not for “interwoven students”
192130240 Embedded computer architectures 1	5	S, Pj	Not for “interwoven students”
192130250 Embedded computer architectures 2	5	S	Not for “interwoven students”
192135310 Modelling and analysis of concurrent systems 1	5	O	Not for “interwoven students”
192135320 Modelling and analysis of concurrent systems 2	5	S, Pj	Not for “interwoven students”
192135400 ADSA Product line engineering	5	S, O, Pre	Not for “interwoven students”
192135450 ADSA Model driven engineering	5	S, O, Pre 2	Not for “interwoven students”
192140122 System validation	5	S, O	
192140700 The numbers tell the tale (meten = weten)	5	O	
192150100 Introduction to computer security	6	S, O	
192150300 Security of information services	5	S	
192160400 Information retrieval	10	S, O	
192170015 Testing techniques	5	S, P	
192194100 Cryptography 1 (TU/e)	6	S	
192194110 Cryptography 2 (TU/e)	6	S, O	
192194200 Verification of security protocols (TU/e)	6	O	



192194300 Linux kernel and hacker's hut (TU/e)	6	O	
192194400 Seminar information security technology (TU/e)	6	O, Pre	
192195100 Software security (RU)	6		
192195200 Security in organisations (RU)	6		
201000207 Security of Information Services	6	S	
192195300 Hardware and operating systems security (RU)			
192195400 Seminar (Privacy) (RU)	6	O, Pre	
192195500 Law in cyberspace (RU)	6		
192320111 Architecture of information systems	5	M or S	
192320220 Advanced architecture of information systems	10	O	Not for "interwoven students"
192320501 Electronic commerce	5	S, Pj	
192320550 XML- Technology	5	S, O	
192320820 Design science methodology	5	M or S	Not for "interwoven students"
192320850 Advanced requirements engineering	10	M or S	
192330301 Specification of information system	5	S, P	
192340041 Software management	5	M or S, O	
192620000 Telematics networks	5	S, P	
192620010 Mobile and wireless networking 1	5	S	

192620020 Mobile and wireless networking 2	5	S, Pre
192620250 Selected topics in P2P systems	5	S, O, Pre
192620300 Performance evaluation 1	5	S, O
192631000 Mobile e-health applications and services	5	Pj
192640020 Business process engineering	5	S, O
192652150 Service-oriented architecture with web services	5	S, O
19265300 Management of networked applications	5	S, O
192653100 Internet management and measurement	5	O
192654000 Network security	5	S, O
192661001 Patterns of software development	5	S, P

1. Students are eligible for this course only if they have taken two bachelor's courses: 191210091 Inleiding telecommunicatie en 191251530 Inleiding telecommunicatiesystemen.
2. Students are eligible for this course only if they have taken at least one of the two subjects 192620300 Performance evaluation, 192653100 Internet management and measurement.

## **o. Transitional arrangements**

### **1. Regulation 2007-2008 for Protocol Engineering**

Occasion: This regulation is necessary because 192651100 Protocol engineering is no longer offered in the academic year 2007-2008. As a consequence the basic knowledge requirements for the Telematics course programme are changed when compared to the corresponding requirements for the academic year 2006-2007 and earlier.

**Term of validity:** until September 1, 2011.

#### **Contents of the regulation**

Until September 1, 2011 students can take the Telematics Master's degree using 192651100 Protocol engineering to meet the requirement *Protocol or internet subject*.

### **2. Regulation 2008-2009 regarding Telematics**

Occasion: This regulation is necessary because the basic level requirements for a Telematics

course programme change per 1 September 2008.

**Term of validity:** until September 1, 2012.

**Contents of the regulation** The following 4 units were among the previous basic subjects requirements, but have been abandoned in the new rules.

191210780 Transmission systems

192640100 Reference models for networked applications

*Protocol or internet subject (see regulation 2007-2008)*

192653000 Management of networked architectures

Under conditions given below, these 4 units are valid substitutes for new requirements, i.e. results obtained for one or more of these units can count as a contribution to the basic level requirements in a student's course programme.

The conditions for substitution are:

- 1 The course programme is approved before 1 January 2009, and
- 2 the results for the substitute (old) units are obtained before 1 September 2009.

### 3. Regulation 2008-2009 regarding Research topics

Occasion: This regulation does not apply for graduate school students. It is necessary because Research topics are a mandatory item in the course programmes of all other M-CS and TEL students, starting 1 September 2008.

**Term of validity:** until September 1, 2012.

**Contents of the regulation:** Students who have their course programme approved before 1 March 2009 can take the degree without a Research topics unit in their programme.

Programmes submitted for approval after 1 March 2009, must contain a Research topics unit. After 1 March 2009, programmes without Research topics can be approved only if the student has explicit permission of the Examination Board.

### 4. Regulation 2009-2010 for ISE and TEL students.

Occasion: This regulation is necessary because 192110830 Advanced distributed multi-media database systems 1 and 192110840 Advanced distributed multi-media database systems 2 are no longer offered in the academic year 2009-2010.

**Term of validity:** until September 1, 2013.

**Contents of the regulation:** Under conditions given below, 192110830 Advanced distributed multi-media database systems 1 is a valid substitute for the basics programme option 192110880 Sensor data management 1. Under the same conditions the combination of 192110830 Advanced distributed multi-media database systems 1 and 192110840 Advanced distributed multi-media database systems 2 is a valid substitute for the combined advanced subjects options 192110880 Sensor data management and 1192110890 Sensor data management 2.

The conditions for substitution are:

- 3 The course programme is approved before 1 January 2010, and
- 4 the results for the substitute (old) units are obtained before 1 September 2010.

### 5. Regulation 2010-2011 regarding Embedded Computing Systems specialization

Occasion: This regulation is necessary because the track Embedded Computing Systems is discontinued starting from September 1, 2010.

**Term of validity:** until September 1, 2014.

**Contents of the regulation** Students who have their course programme approved before September 2010 can still finish this specialization.

#### **6. Regulation 2010-2011 regarding Computer Ethics**

**Occasion:** This regulation is necessary because Computer Ethics (191612680, 5 EC) is a mandatory item in the course programmes of all M-CS and TEL students, starting 1 September 2010.

**Term of validity:** until September 1, 2014.

**Contents of the regulation:** Students who have their course programme approved before 1 September 2010 can take the degree without Computer Ethics as a unit in their programme. Programmes submitted for approval after 1 September 2010, must contain Computer Ethics (191612680, 5 EC) as a unit.

## **Admissions appendix to the Teaching and Examination Regulations of the Master's programmes Computer Science and Telematics**

The regulations in this appendix are part of the teaching and examination regulations of the Master's programmes Computer Science and Telematics of the Faculty of Electrical Engineering, Mathematics and Computer Science of the University of Twente.

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### **Admission**

Enrolment as a student is required to sit interim examinations and to be eligible to earn the Master's diploma. In order to be enrolled, students must demonstrate that they have been admitted to one of the Master's programmes.

Admission involves an assessment of the student's eligibility for the Master's programme of his/her choice. The Dean has appointed the admissions board with the power to determine admissibility. If the admissions board positively assesses an application for admission, it issues a certificate of admission. Students with a certificate of admission are eligible for enrolment by the Central Student Administration. Enrolment will only take place if the other admission requirements maintained by the UT have also been satisfied.

### **Admission pursuant to a regulation**

The Teaching and Examination Regulation stipulates that certain groups of students are eligible for admission. (Article 4.1).

1. Students in possession of a diploma which shows that they have passed the final examination for the *Elektrotechniek* (TU/e, TUD, UT), *Technische Informatica* (TU/e, TUD, UT), *Telematica* (UT) or *Informatica* (RUG, UU, UvA, VU, UL, RU, OU) Bachelor's programme will be eligible for admission to the programmes.  
In addition, students in possession of a diploma which shows that they have passed the final examination for the *Elektrotechniek* (TU/e, TUD, UT) Bachelor's programme are eligible for admission to the Telematics programme.

In addition to these provisions from the Teaching and Examination Regulation, the Dean has adopted the following provisions:

1. Applicants who satisfy the following three requirements are eligible for admission to the CS Master's programme.
  - a. The applicant is holder of a diploma from Saxion Universities (Saxion Hogeschool Enschede) demonstrating that he or she has satisfied the requirements of the final assessment of the Computer Science (Informatica) Bachelor's programme or the Technical Computer Science (Technische informatica) Bachelor's programme
  - b. The applicant has successfully completed the Advanced Algorithms elective module as part of his or her bachelor's course programme
  - c. The applicant, according to UT records, has sat the interim examination of either the subject 214025 ADC plus or the subject 214020 ADC while completing the Advanced Algorithms elective module and received a mark of 6, 7, 8, 9 or 10 or, if no mark is awarded, 'pass' ('G' in Dutch)
2. Applicants who satisfy the following requirements are eligible for admission to the CS Master's programme.
  - a. The applicant is holder of a diploma from the University of Twente demonstrating that he or she has satisfied the requirements of the final assessment of the Advanced Technology Bachelor's programme.
  - b. The applicant has successfully completed the following electives as part of his or her bachelor's course programme
    - 192135000 - Programmeren 1
    - 192135050 - Programmeren 2
    - 192110741 - Gegevensbanken
    - 192140250 - Algoritmen, Datastructuren en Complexiteit plus
    - 192110452 - Besturingssystemen
3. Applicants who satisfy the following requirements are eligible for admission to the TEL Master's programme.
  - a. The applicant is holder of a diploma from the University of Twente demonstrating that he or she has satisfied the requirements of the final assessment of the Advanced Technology Bachelor's programme.
  - b. The applicant has successfully completed the following electives as part of his or her bachelor's course programme
    - 192135000 - Programmeren 1
    - 192135050 - Programmeren 2
    - 192630000 - Telematicadiensten
    - 192610000 - Telematicasystemen en toepassingen
    - 192140250 - Algoritmen, Datastructuren en Complexiteit plus<sup>6</sup>

Finally, the Dean draws up regulations (transitional arrangements) governing the admission of students to one of the Master's programmes who, prior to 1 September 2003, were enrolled in the single cycle *ingenieur* programme on which the Master's programme is based. These transitional arrangements are outlined in the course guide for single cycle academic

programmes. (A single cycle *ingenieur* programme is a four or five year course in engineering, with a diploma at Master's level, in which a Bachelor's programme is included, but without a separate Bachelor's diploma.)

### **Admission to the Master's programmes after individual assessment**

In all other instances, the admissions board conducts a detailed assessment of the applicant's eligibility for admission. This assessment takes the following factors into account:

- a. the highest diploma earned by the applicant: This must be at least a Bachelor's diploma from a recognised higher education institution. If such a diploma cannot be produced, the admissions board will ask for a statement attesting to the equivalency of the applicant's qualifications with the Bachelor's diploma required. The body issuing this statement must be authorised to do so.
- b. the nature of the degree course and the content of the course programme completed by the applicant, the speed with which the course programme was completed and the marks earned: The nature of the degree course, content of the course programme and marks earned for the individual units of study must clearly demonstrate that the applicant has the fundamental academic skills and appropriate basic knowledge for the Master's programme or is able to compensate for any gaps in basic knowledge.
- c. the student's motivation for applying for admission
- d. the applicant's command of English: This only applies to international students. The threshold values for sufficient command of English are in Article 4.4 under a of the Teaching and Examination Regulation.

### **Variations in admission decisions**

#### **Issuing an unconditional certificate of admission**

The admissions board may decide to admit applicants to the Master's programme after assessing their file. These applicants will be issued a certificate of admission.

#### **Issuing a conditional certificate of admission**

The admissions board may not reach a final decision about admission, because it finds insufficient or formally incorrect evidence of the applicant's status in the application file. In such a case the board can decide to admit the applicant conditionally. The student can enrol at the UT on the condition he or she submits the evidence lacking in the original application file to the satisfaction of the admissions board. (A typical case of conditional admission is when the applicant's file shows no formal proof of sufficient proficiency in English.)

#### **Issuing a certificate of pre-Master admission**

In some cases, the admissions board will issue applicants a certificate of pre-Master admission. While these individuals may enrol at the UT, they are not entitled to sit interim examinations or to have the final assessment conducted.

Pre-Master admission is associated with a pre-Master's programme, i.e. a list of units of study, the attainment targets and learning objectives of which are at the undergraduate level. Students in this category must first successfully complete this pre-Master's programme to be fully admitted to the Master's programme and become fully enrolled students with all the

associated rights. Certificates of pre-Master admission are valid for a limited term (generally one year). Students who are not fully admitted during this term must re-apply for admission. Completing a pre-Master's programme to convert a pre-Master admission to 'fully admitted' student status is often referred to as 'overcoming deficiencies'.

NB: While the results earned as part of an undergraduate-level pre-Master's programme do not count towards a Bachelor's degree, a certificate is awarded in recognition of the academic achievements during the pre-Master's programme.

### **Issuing a certificate of admission with additional requirements**

The admissions board may attach additional requirements to a certificate of admission (also to conditional and pre-Master admissions). These additional requirements do not impact the right to enrol, sit interim examinations or have the final assessment conducted. They do, however, impact the regulations governing successful conclusion of the Master's programme final assessment. With this admission decision, the admissions board establishes additional requirements for the course programme to satisfy in order to successfully pass the Master's programme final assessment. Naturally, the additional requirements will be limited to the extent that the student will still be able to complete the programme with a study load of 120 credits.

The additional requirements placed on the course programme are referred to as 'homologation'. Please refer to the programme appendix, section e.

### **Issuing a certificate of admission with a requirements waiver**

Article 13.3 of the Teaching and Examination Regulation stipulates that the Examination Board may not honour requests for exemptions based on results earned as part of a Bachelor's programme. However, the Examination Board may waive a requirement placed on the course programme in recognition of the results earned as part of a Bachelor's programme and, consequently, permit the student to successfully pass the Master's programme final assessment with a course programme that does not satisfy all the formal requirements. Students who wish to have a waiver for requirements placed on the course programme based on their undergraduate education should submit a request to the admissions board. The admissions board will render a decision on the request on behalf of the Examination Board. If granted, it will issue a certificate of admission with a waiver for requirements, thereby granting the student the right to have the Master's programme final assessment conducted without meeting all the formal requirements. Such a waiver will never affect the Master's programme study load. A study load requirement of less than 120 credits is not permitted.

## **Special regulations**

### **Sitting interim examinations when not admitted to a Master's programme**

In some cases, it is possible to sit interim examinations when not admitted to the relevant Master's programme. A number of conditions, however, have to be satisfied:

- a. The student must be enrolled at the UT.
- b. The student must have a confirmation of admission (maybe conditional, maybe with additional requirements) or be a holder of a propedeuse (first year) diploma of a Bachelor's programme, the final diploma of which permits automatic admission



according to the Teaching and Examination Regulations.

Students who satisfy these conditions can submit a request to the Examination Board to be registered as a student in interwoven programmes. Students with this status can sit Master's programme interim examinations prior to being admitted and enrolled in the Master's programme.

Students with interwoven programmes are subject to a number of limitations. For example, the package of units of study such a student may complete in the Master's programme may not exceed 60 credits. In addition, these students may not take units of study for which the Examination Board has established a Bachelor's diploma as a compulsory prerequisite. The Examination Board assesses the requests for the interwoven status and retains the right to reject requests when it feels a student will not benefit from graduate-level education.