

***Programme-specific appendix  
of the Technical Medicine (TM)  
Master's Programme  
Course and Examination Regulations  
(art. 7.13 and 7.59 WHW)***

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Reference: TNW100006/vdh  
Date: 26<sup>th</sup> March 2010

## Preamble

- a. The rules in this appendix apply to the full-time Technical Medicine Master's programme (Croho-number 60033).
- b. Together with the General Section (TNW100001/vdh) and the Technical Medicine Board of Examiners Rules (TNW 100011/vdh), this appendix constitutes the programme part of the Student Statute, including the Course and Examination Regulations of the Technical Medicine Master's programme of the Faculty of Science and Technology at the University of Twente.
- c. In the event of disagreement, the Dutch appendix and not this English version of the appendix is legally-binding.
- d. The Act refers to the Higher Education and Research Act (WHW).

## Article 1 Definition of terms

The meaning of terms appearing in these regulations is the same as that of terms appearing in the Higher Education and Research Act (Wet op het hoger onderwijs). In addition to the definition of terms in article 1 of the general section, the definition of terms in this appendix is as follows:

1. Clinical specialisation internship: the internship in which the Master's final project is carried out.
2. Practical clinical training: practical skills training regarding diagnostics and therapy.

## Article 2 Objective and programme learning outcomes

The professional profile indicates the final outcomes and is the frame of reference for how Technical Medical Practitioners approach and solve problems. Subsequently, a competency profile is developed describing the competencies which Technical Medical Practitioners must have upon graduation.

A competency profile is devised according to a structuring principle. Concerning 3TU<sup>1</sup>, based on research concerning academic education, there are seven discernible competency areas that characterise a technological academic<sup>2</sup>. These academic competencies are based on the Dublin Descriptors and the Higher Education Accreditation Commission's final report<sup>3</sup>, an unofficial list of qualifications for Bachelor's and Master's students by the Association of Universities in the Netherlands (VSNU). Besides theory-formulation, design and application also play an important role in the competency profile. It does not simply concern analysis, modelling, elucidation or interpretation of phenomena, but also knowledge synthesis for the purpose of design and new systems within a tangible social context. Consequently, imagination, creativity, problem-solving and integrative ability are important characteristics of a technically-trained Technical Medical Practitioner.

All the objectives in terms of knowledge, skills and attitudes are categorised under the seven umbrella and related competencies of the Technical Medicine Master's programme. They are formulated so as to describe the specialisation level of all the Master's tracks (specialisations) and serve as a guide for determining the more specific objectives of these tracks.

The seven competency areas are not isolated, and it is precisely their interrelation and integration that makes the competency profile consequential. This interrelation is represented in the Technical Medicine outline below.

*Domain = What?*

- **Competent in the Discipline Technical Medicine**
- Competent in Research and Design
- Competent in Medical-Technical practice

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<sup>1</sup> 3TU is the partnership between the University of Twente, Delft University of Technology and Eindhoven University of Technology.

<sup>2</sup> Meijers, A.W.W. et al. (2005). *Criteria for Academic Bachelor's and Master's Curricula (Criteria voor Academische Bachelor en Master Curricula)*. TU/e: Eindhoven.

<sup>3</sup> Higher Education Accreditation Commission Final Report, Inspiration, Performance and Presentation (Franssen Commission), Ministry of Education, Culture and Science publication, 2001. (Eindrapport Commissie Accreditatie Hoger Onderwijs Prikkelen, Presteren en Profileren (Commissie Franssen), publicatie van het Ministerie OC&W, 2001).

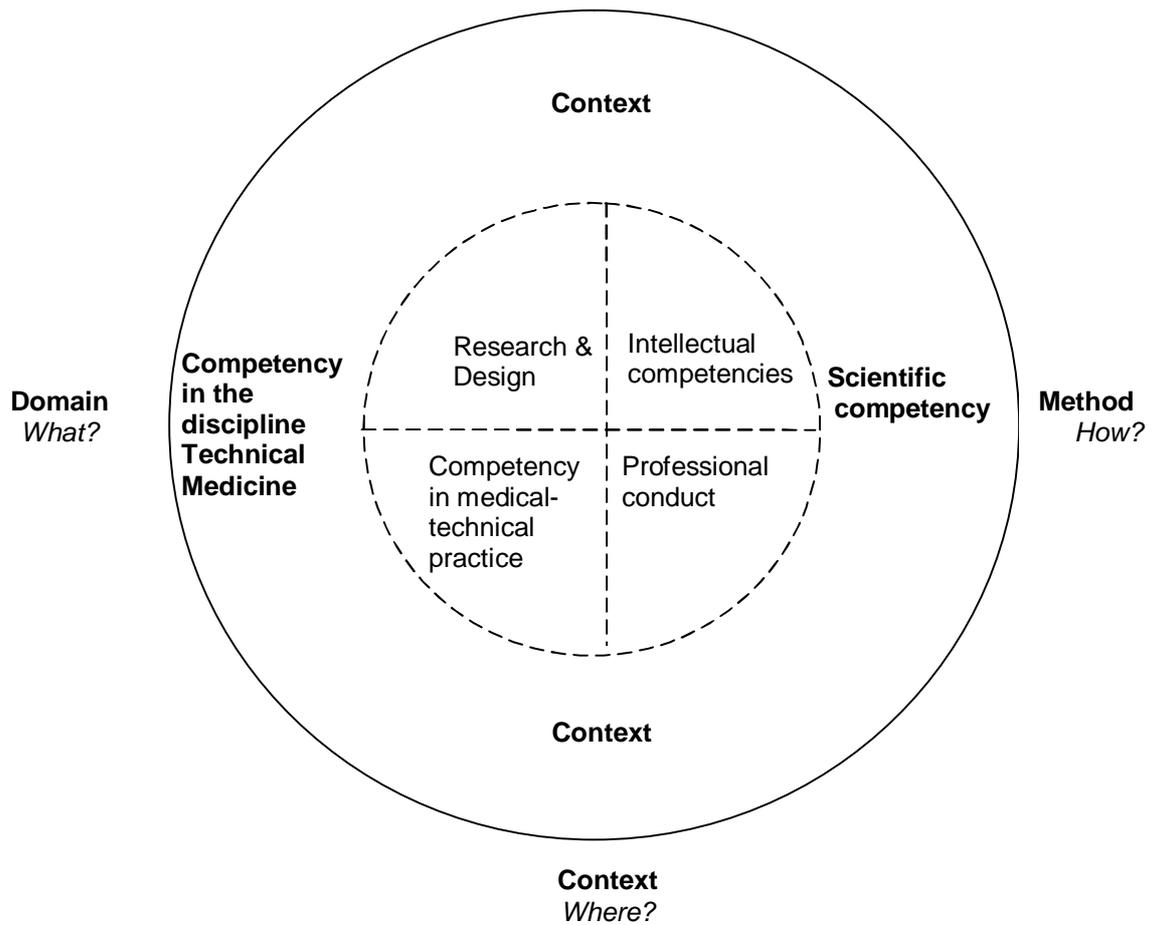
*Method = How?*

- **Competent in Scientific Approach**
- Intellectual competency
- Competent in Professional Conduct

*Context = Where?*

- Situational competency / Competent in context-oriented practice

### Technical Medicine Competency Outline



## Domain = What

### 1 Competent in the discipline Technical Medicine

*Technical Medical Practitioners are familiar with current scientific knowledge and are capable of expanding this by means of studying.*

- TMPs (Technical Medical Practitioners) possess knowledge of and insight into the healthy state of the complete human system and all its sub-systems.
- TMPs possess knowledge of and have insight into the general characteristics and consequences of essential pathophysiological concepts for each of the sub-systems.
- TMPs possess knowledge of and insight into core concepts and consequently into the structure of and interrelation between the relevant technological disciplines. Of these, TMPs understand crucial aspects, such as theories, new methods & techniques and current issues.
- TMPs possess knowledge of the essential concepts and consequently of the global structure and interrelation of the supporting disciplines.
- TMPs possess knowledge of how theory-formulation, model-formulation and validation occur in their own and other relevant disciplines, and are able to apply this. Equally, TMPs understand the manner of interpretation, experimentation, data collection, simulation and decision-making.
- TMPs can reflect on standard methods and applied assumptions; can question these; can propose modifications and estimate their implications.
- TMPs are capable of detecting gaps in knowledge and are capable of revising and expanding knowledge by means of studying. TMPs are aware of the need for life-long learning and assessment.

### 2 Competent in research and design

*Technical Medical Practitioners are capable of acquiring new scientific knowledge through research and development of treatment plans and diagnostic methods.*

*Research in this sense entails: goal-oriented and methodical development of new knowledge and insights.*

*Design in this sense entails: a synthesizing activity, focussing on attaining new or modified diagnostic and/or therapeutic strategies and methods.*

- TMPs are capable of analysing which pathophysiological core concepts pertain to a particular disease.
- TMPs are capable of analysing which technological core concepts can be used to solve medical problems.
- TMPs are capable of finding a solution for a medical problem and making a design for it, on the basis of an analysis of the pathophysiological core concepts involved and with the aid of technology.
- TMPs are capable of using fundamental concepts from supporting disciplines regarding professional practice in a clinical context.
- On the basis of analysis and interpretation of research results, TMPs are capable of setting up research independently in order to test a possible solution to a problem, make a design for it and to carry it out in a real or a virtual setting.
- TMPs are capable of observing certain relationships from different perspectives, of devising hypotheses or discovering applications.
- TMPs are capable of interdisciplinary work and have the ability to analyse when the input of other disciplines is desired regarding research or the design process.
- TMPs are aware of the variability of the research and design process due to external circumstances or evolving insight. Subsequently, TMPs are able to guide this process.
- TMPs are capable of contributing independently to the development of scientific knowledge within the discipline in question.
- TMPs are capable of (re)formulating design problems and are able to justify this interpretation to the parties involved.
- TMPs possess synthesizing skills with regard to medical problems and are able to make a design plan and implement it independently.
- TMPs are capable of formulating new research questions based on a design or implementation problem.
- TMPs are capable of making decisions regarding design and to systematically justify and evaluate these.

### 3 Competent in medical-technical practice:

*Technical Medical Practitioners are capable of applying medical technology in the diagnostic and therapeutic process of medical practice, on the basis of integrated knowledge, skills, planning and reflection. This practice also focuses on innovation.*

- TMPs have mastered the process of technical-medical problem-solving. They are able to indicate pathophysiological abnormalities and carry out suitable treatment for each individual patient.
- TMPs are capable, depending on the type of health care issue, of systematically working through the diagnostic process and consequently determining the correct approach for the problem.
- Having analysed the situation, TMPs are capable of acting strategically on the basis of generalisation of what has been learnt (based on similarities) and of specification, based on insight into the exceptions of the situation (based on differences).
- TMPs distinguish a patient's complaint based on its nature and severity and assess the need for intervention.
- Based on a working hypothesis, TMPs establish a treatment plan and implement it within a multidisciplinary treatment team, within the limits of their knowledge and experience, and in compliance with medical-ethical considerations.
- TMPs have their own responsibility within a multidisciplinary team and make medical-technical decisions, within the limits of their knowledge and experience and in compliance with medical-ethical considerations.
- TMPs have the competency to skilfully carry out technical-medical tasks.

#### Method = How

### 4 Competent in scientific approach:

*Technical Medical Practitioners have a systematic approach, based on the clinical-empirical cycle and characterised by development and use of theories, models and interrelated interpretations, have a clinical attitude and have insight into science and technology.*

- TMPs are capable of collecting, analysing and interpreting information for a medical problem, and in compliance with medical-technological core concepts and fundamental technological concepts, of determining a justified approach for solving a medical problem.
- TMPs are capable of analysing and interpreting research results on the basis of medical, technological and supporting core concepts.
- TMPs are capable of making a decision for a justified approach for a clinical problem, on the basis of analysis and interpretation of research results.
- TMPs have insight into the nature of science and technology and possess knowledge of current discourse on the subject, (objective, methods, differences and similarities between areas of science, nature of laws, theories, explanations, the role of experiments, objectivity, etc.).
- TMPs have insight into scientific medical-technical practice and into current discourse on the subject.
- TMPs are capable of adequately documenting and publishing research and design results, with the aim of contributing to knowledge development in the Technical Medical discipline.

### 5 Intellectual competency:

*Technical Medical Practitioners are capable of reasoning, reflecting and forming opinions. These are skills that are acquired or improved within the context of a discipline and are subsequently generically applicable.*

- TMPs are able to independently reflect on their own considerations, decisions and practice, and based on this, adjust their behaviour.
- TMPs are able to reason logically and are able to apply methods of reasoning such as induction, deduction, analogy, etc.
- TMPs are able to ask suitable questions and have a constructively-critical attitude when analysing and solving clinical problems.
- TMPs are able to form a rational opinion in the event of incomplete or irrelevant data.
- TMPs are able to take a certain viewpoint regarding a scientific argument within the discipline and are able to evaluate this critically.
- TMPs possess numerical skills and understanding of orders of magnitude.

## 6 **Competent in Professional Conduct:**

*Professional Medical Practitioners have a personal style of work (manifested in verbal communication, behaviour and appearance), where the standards and values of the practice of their profession are evident. These concern behavioural dimensions associated with tasks/work, others and themselves.*

- TMPs are characterised by professional conduct. This entails reliability, commitment, precision, perseverance, independence, respect for others regardless of their life phase, socio-economic status, education, culture, philosophy of life, sexual orientation, race or gender.
- On the basis of an estimate/ analysis of another person's level of expertise and need for information, TMPs are capable of conveying both orally and in writing research results, designs, ideas, solutions in a scientifically-justified manner as well as comprehensible for another.
- TMPs hold constructive dialogues with patients and are responsible for medically-justified, shared decision-making.
- TMPs are able to do project-based work; possess pragmatism and a sense of responsibility; are able to cope with limited resources; are able to cope with risks; are able to make compromises.
- TMPs are able to communicate orally and in writing about research results, designs and solutions with patients, colleagues and others in a second language.
- TMPs are able to debate about the discipline and the position of the discipline within society, and are able to give presentations about their discipline.
- TMPs are able to work in a multidisciplinary team. This entails that TMPs have insight into and are able to cope with team roles and social dynamics. TMPs are able to assume the role of a team leader.
- TMPs have a critical view of their own technical-medical practice and are capable of reflection i.e. studying their own performance and its effect (on themselves, others and work) from different perspectives and realise the (corresponding) consequences, and are aware of their responsibility for the well-being of their patient.
- TMPs monitor the progress of their own learning process, and for that purpose are able to process and apply feedback they have received to their own practice.

### **Context = Where**

## 7 **Situational Competency:**

*Technical Medical Practitioners are capable of integrating the social and organisational situation into medical-technical practice.*

- TMPs understand the relevant internal and external developments within the historical context of the relevant disciplines and the interaction between both.
- TMPs are capable of analysing and discussing the social consequences of new developments in relevant disciplines with colleagues and others.
- TMPs are capable of analysing the consequences of scientific thought and practice on the patient and his/her environment.
- TMPs are capable of analysing and discussing the ethical, legal and normative aspects of the consequences and assumptions of scientific thought and practice with colleagues and others, and of integrating this within their practice.
- TMPs are aware of the different roles of professionals in society and consciously choose their own role.
- TMPs take into account financial, logistical and other limiting factors within the health care sector when making decisions.
- TMPs are capable of adapting their knowledge, skills and attitudes to the changing health care sector, to scientific and social possibilities and to economic, legal and ethical limits.

### **Article 3 Admission commission**

1. The Dean of the TNW Faculty establishes an admission commission for the purpose of admitting students to the Master's programme for whom the Master's programme in question is not a follow-on Master's as stipulated in article 7.30a of the Act.
2. The commission, as stated in clause 1, has been authorised by the Executive Board (reference S&C/387.191/lk) to admit or reject applicants.
3. The admission commission consists of a minimum of two members, including:
  - a. the Programme Director;
  - b. the study advisor;
  - c. in the case of foreign students, the internationalisation coordinator;The Programme Director is the chairperson of the admission commission.  
The chairperson of the commission may ask the board of examiners for advice.

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

1. Direct admission to the programme will be given to students who:
  - a. are in possession of a Technical Medicine Bachelor's degree from the University of Twente, or
  - b. have passed the University of Twente's Technical Medicine Bachelor's programme final project (Multidisciplinary Project), or
  - c. possess proof of admission to the programme, issued by the admission commission.
2. Regarding assessment of an admission request for the Master's programme, the admission commission may require that certain subjects are passed before proof of admission to the Master's programme is issued.
  - a. Students with a Bachelor's degree are admissible to the Master's programme in the case of a deficit of 30 ECs or less.
  - b. In the case of a deficit of between 30 and 60 ECs, if possible an individual pre-Master's course will be arranged with a duration of a maximum of 1 year.
  - c. In the case of a deficit of more than 60 ECs, students are not admissible.
3. When issuing proof of admission to the Master's programme, the admission commission may award exemptions from certain components of the Master's, with the exception of the clinical internships and the clinical specialisation internship.
4. Rulings referred to in clause 3 of this article made by the admission commission require approval from the board of examiners.
5. Students who have a foreign educational background must be able to demonstrate their proficiency in Dutch, both oral and written. Proof that their score on a certified test meets the NT2 (Dutch as a second language, programme II)-standard may be an admission requirement.

### **Article 5 Language**

The theoretical component in the programme is taught and examinations are held in English, unless those involved decide otherwise. The practical clinical component is taught and examinations are held in Dutch.

## Article 6 Standard Master's programme

### Master's first year

First Term		Second Term		Third Term		Fourth Term	
Case 1	5 ECs Compulsory subject	Case 1	5 ECs Compulsory subject	Case 2	5 ECs Compulsory subject	Case 2	5 ECs Compulsory subject
	5 ECs Compulsory subject		5 ECs Elective		5 ECs Compulsory subject		5 ECs Elective
	3 ECs Skills	4 ECs	3 ECs Skills		3 ECs Skills	4 ECs	3 ECs Skills

### Master's second year

First Term		Second Term		Third Term		Fourth Term	
15 ECs Clinical Internship							
Skills		Skills		Skills		Skills	

### Master's third year

First Term	Second Term	Third Term	Fourth Term
<b>3 ECs</b> Laboratory Animal Science <b>57 ECs</b> Clinical Specialisation Internship			

- Besides the compulsory components of the current study programme, students themselves choose one or more study components. The programme must, whether completely or partially, basically consist of study components, which are taught for the purpose of one's own programme and which can be supplemented by study components that are taught for the purpose of other programmes and/or by other institutions of scientific education.
- Students submit in advance a request for the approval of a choice of one or more study components, as stipulated in clause 1, to the board of examiners. The request is accompanied by clear arguments and approval from the track coordinator.
- A decision by the board of examiners to withhold approval must be well-founded, and can only be made once the student in question has been given the opportunity to be heard.
- The board of examiners must rule within twenty days after receipt of the request. The board of examiners may only delay the decision for a maximum of ten working days. Students are informed in writing of the delay after the aforementioned period has lapsed.
- Students will immediately be informed of the ruling in writing.
- Students may only start with an elective once the board of examiners has given its approval.
- Regarding clinical internships, there are three possible intake dates per year: in September, December and March. Intake in June is not possible.

## Article 7 Period of validity of clinical-practical experience

Contrary to that stated in article 16 of the general section, clinical internships that have been successfully completed are valid for 3 years subsequent to the academic year in which the examination section was taken.

## **Article 8 Transitional regulations**

1. If the study programme included in article 6 of this appendix is amended, or if one of the articles included in the general section or programme appendix is amended, the Programme Director will stipulate and publish transitional regulations.
2. The conditions which transitional regulations must meet are stipulated in article 29 of the general section.
3. The transitional regulations are published on the programme's website.

## **Article 9 Safety**

There are safety requirements for working in a laboratory. Students are obliged to inform themselves of these rules<sup>4</sup> and to adhere to them.

## **Article 10 Practical exercises**

It is not required to pass units of study that include practical exercises until after these practical exercises have been carried out.

## **Article 11 Sequence of units of study**

1. Before starting a unit of study, students must meet the prior knowledge requirements of that unit of study.
2. The sequence in which examinations must be taken and the sequence of doing internships, is stipulated in the syllabi of the relevant study components.
3. Students may start the first clinical internship of the second year of the programme if they have obtained the Bachelor's degree as well as 50 ECs from the first year, seven weeks prior to the start of the internship.
4. Students who have included the study component Radiation Expertise in their study programme and who wish to start their first clinical internship of the second year of the Master's, may have this extra subject pending at the moment of assessment.
5. Students can proceed to the second clinical internship of the second year if they have passed the first year of the programme and the first clinical internship.
6. The Programme Director, in consultation with the clinical internship assessment commission, may rule that an internship be terminated. An internship that is suspended due to unsatisfactory performance on behalf of the student, is graded as a 'fail'.
7. In exceptional cases, students may on a single occasion be given the opportunity to demonstrate they have sufficiently developed their competencies, by means of an extra internship.
8. If a student receives a fail on two occasions for his/her internship final assessment, he/she is barred from subsequent internships and consequently from the third year of the programme.
9. Students can start the third year of the programme if they have completely finished the second year and have done the Laboratory Animal Science course.
10. Before the final colloquium can be held, all other units of study need to have been passed.

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<sup>4</sup> See the 'Health & Safety and Environmental Regulations' ('Arbo- en Milieureglement') on <http://www.tnw.utwente.nl/intra/diensten/amh/> and the TNW laboratory practice group information on [http://www.tnw.utwente.nl/onderwijs\\_overig/practica/](http://www.tnw.utwente.nl/onderwijs_overig/practica/).

11. The board of examiners is authorised to dispense with the requirements stipulated in clauses 1 to 9 of this article, in the event that strict adherence to that which is stipulated would result in an unwarranted delay in study progress. Students can submit a request for this to the board of examiners.

#### **Article 12 Flexible programme**

Contrary to that which is stipulated in article 6 of this appendix, students can request permission from the board of examiners to follow a flexible programme as stipulated in art. 7.3c of the Act. The board of examiners assesses whether the programme corresponds to the programme's field, is coherent and is of a sufficient standard in light of the programme's learning outcomes.

#### **Article 13 Student Counselling**

1. For the purpose of student counselling, the Programme Director appoints a study advisor. He/she is on the one hand, responsible for advising and counselling students individually regarding all aspects of their studies, and on the other hand, for providing the programme with recommendations regarding education policy relating to students. These duties are stipulated in the document 'Student counselling and the work of a study advisor'.
2. A study advisor, whether requested or not, gives recommendations regarding decisions to be made that affect individual students; in which case the study advisor and board of examiners will regard information provided by the student as strictly confidential.

#### **Article 14 Inception date and amendments**

These regulations will come into effect on 1<sup>st</sup> April 2010 and replace the regulations dated 13<sup>th</sup> September 2007.

**Enacted by the Dean of the Faculty, having obtained recommendations from the Faculty Council and programme commission.**

Enschede, dated 26<sup>th</sup> March 2010