



# **Teaching and Examination Regulations**

MASTER's Degree Programme

Medical Natural Sciences

B. Programme-specific section

Academic year 2017-2018

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**Section B: Programme-specific section****1. General provisions****Article 1.1 Definitions**

Not applicable

**Article 1.2 Degree programme information**

1. The programme in Medical Natural Sciences (CROHO number 60800) is a full-time programme taught in English.
2. The programme consists of 120 credits.
3. Preferably an educational unit comprises 6 credits or a multiple thereof, with the following exceptions:

Course code	Course component	EC
O_MLADEPII	Algemene didactiek II Clinical Development and Clinical	3
AM_1180	Trials	3
O_MFDIDAC_3	Didactiek 3	9
O_MLDIDAC_3	Didactiek 3	9
AM_1179	Epidemiology	3
X_422592	Ethics in Biomedical Research	3
XM_422613	Major research Project	39
XM_422614	Minor research Project	21
XM_42000	Minor research Project 27EC	27
O_MFPRAK_2	Praktijk 2	9
O_MLPRAK_2	Praktijk 2	9
O_MFPRAK_3	Praktijk 3	15
O_MLPRAK_3	Praktijk 3	15
O_MLPRAKI	Praktijk I	15
O_MLPRAKII	Praktijk II	15
O_MFPROZ_1	Praktijkonderzoek 1	3
O_MLPROZ_1	Praktijkonderzoek 1	3
O_MLVPOOI	Prof. ontwikkeling en onderzoek I	3
M_CPROTBI09	Proteomics in Biomedical Research	3
X_420563	Scientific Writing in English for MNS	3
O_MLVDNAI	Vakdidactiek Natuurkunde I	3
O_MLVDSKI	Vakdidactiek Scheikunde I	3
O_MLVERD	Verdieping	3

**Article 1.3 Intake dates**

The programme is offered starting in the first semester of the academic year only (1 September). The intake date(s) mentioned in this paragraph ensure(s) that a programme can be completed within the nominal study duration set for the programme.

**2. Programme objectives and exit qualifications****Article 2.1 Programme objective**

The objective of the programme is that students should acquire sufficient knowledge, skills and insight within the field of Medical Natural Sciences, and any related disciplines, to be able to operate as an independent professional at an academic level, and to be a suitable candidate for a subsequent course of study leading to a career in research or development.

Another aim of the programme is to develop students' understanding of the interrelationships between academic disciplines, as well as their sense of social responsibility.

**Article 2.2 Exit qualifications**

In all events, the graduate:

- has a sound theoretical and practical understanding of the modern medical natural sciences (including the requisite knowledge of other disciplines);
- has a thorough knowledge of theoretical and experimental methods, as well as research experience in at least one sub-field of medical natural sciences;
- is capable, within a reasonable period of time, of becoming conversant in other sub-fields of the discipline;
- is capable of formulating a work plan for research within the medical natural sciences, on the basis of a realistic research question;
- is capable of analysing and formulating research results, and of drawing conclusions from them;
- is capable of writing a report, or an academic paper for publication in an international journal, and of participating in a discussion on a topic related to the field of study in question;
- is capable of studying the professional literature (including international publications) in relevant sub-fields, and of utilizing the relevant content;
- is capable of applying knowledge of the medical natural sciences within a wider, multidisciplinary context;
- is capable of dealing with the ethical, safety and environmental aspects of the medical natural sciences;
- is capable of taking on posts for which knowledge and research skills in the field of the medical natural sciences are required;
- has sufficient knowledge of and insight into the social role of the medical natural sciences to decide on a responsible choice of profession and professional practice;
- is capable of cooperating with others, of imparting knowledge to others, and of delivering a lecture both to specialists and to a wider audience.

#### *Research variant*

The graduate:

- is capable of independently designing, conducting and assessing experiments and the associated controls with a given period of time;
- is capable of contextualizing the results and conclusions obtained, within the framework of results obtained by others;
- is capable of formulating a perspective on the development of scientific research within the field in question;
- is capable of quantitatively and qualitatively analysing medical, biological, chemical and physical processes, entering the data into existing models (or models yet to be developed), and presenting the results at various levels of abstraction;
- must possess insight into the role of the medical natural sciences in a sustainable society.

#### *Communication and Education variants*

The graduate can:

- independently acquire new knowledge of the subject in the area of communication and education, and can apply this in professional situations within the sphere of communication/education;
- impart any knowledge and insights obtained, verbally and in writing, both in educational contexts and to wider audiences.

#### *Societal variant*

The graduate can:

- develop a perspective on the contributions that scientific knowledge and methods can potentially make to social problems related to the field in question;
- distil a research question from this perspective that is geared towards solutions;
- implement such questions in the form of targeted research;
- interpret and present data obtained from analyses conducted at different scales and different levels of abstraction;
- cooperate with others in the context of a multidisciplinary project team.

The programme emphasizes:

- the student's personal development, the student's sense of social responsibility and the student's communication skills in the English language.

### 3. Further admission requirements

#### Article 3.1 Admission requirements

1. Admission to the Master's programme is possible for an individual who can demonstrate that he/she has the following knowledge, understanding and skills at the Bachelor's degree level, obtained at an institution of academic higher education:
  - a. knowledge: mathematics, physics and chemistry at least comparable with the bachelor Medische Natuurwetenschappen;
  - b. understanding: mathematics, physics and chemistry at least comparable with the bachelor Medische Natuurwetenschappen
  - c. skills: academic communication skills and computer programming and experimental skills at least comparable with the bachelor Medische Natuurwetenschappen;
2. The Admission Board will investigate whether the interested person meets the admission requirements.
3. In addition to the requirements referred to in the first paragraph, the Admission Board will also assess requests for admission in terms of the following criteria:
  - a. talent and motivation to participate successfully in multidisciplinary research teams in the field of Medical Natural Sciences;
4. When the programme commences, the candidate must have fully completed the Bachelor's programme and pre-Master's programme allowing admission to this Master's programme.

#### Article 3.2 Pre-Master's programme

1. Students with a Bachelor's degree in a field that corresponds to a sufficient extent with the subject area covered by the Master's programme can request admission to the pre-Master's programme.
2. The pre-Master's programme is tailor-made and comprises [30] EC is typically made up of the following units of study:
  - a. Vectorcalculus (3 EC)
  - b. Optica en optisch waarnemen (6 EC)
  - c. Differentiaal vergelijkingen (6 EC)
  - d. Statistiek (6 EC)
  - e. Thermodynamica (6 EC) or Van Quantum tot molecuul (6 EC)
3. Proof of a successfully completed pre-Master's programme serves as proof of admission to the Master's programme specified within it in the subsequent academic year.4. In addition to the pre-master programme, the following courses are to be included in the master programme: "Biomedische Beeldvorming" and "Inleiding Medische Beeldanalyse" for the variant Medical Physics, and the courses "Mechanics and Thermodynamics in the Cell" and "Microscopy and Spectroscopy" for the variant Physics of Life and Health. The free elective space in the master programme offers the schedule opportunities to fulfill these requirements.

#### Article 3.3 Limited programme capacity

Not applicable

#### Article 3.4 Final deadline for registration

A candidate must submit a request to be admitted to the programme through Studielink before 1 June in the case of Dutch students, before 1 April in the case of EU students and before 1 February in the case of non-EU students. Under exceptional circumstances, the Examinations Board may consider a request submitted after this closing date.

#### Article 3.5 English language requirement for English-language Master's programmes

1. The proficiency requirement in English as the language of instruction can be met by the successful completion of one of the following examinations or an equivalent:
  - VWO-diploma
  - IELTS: 6.5
  - TOEFL paper based test: 580
  - TOEFL internet based test: 92-93
  - Cambridge Advanced English: A, B or C.
2. Exemption is granted from the examination in English referred to in the first paragraph to students who, within two years of the start of the programme:

- met the requirements of the VU test in English language proficiency TOEFL ITP, with at least the scores specified in paragraph 1, or
- had previous education in secondary or tertiary education in an English-speaking country as listed on the VU website, or
- have an English-language 'international baccalaureate' diploma

#### Article 3.6 Free curriculum

1. Subject to certain conditions, the student has the option of compiling a curriculum of his/her own choice which deviates from the curricula prescribed by the programme.
2. The concrete details of such a curriculum must be approved beforehand by the MNS master coordinator and the most appropriate Examination Board.
3. The free curriculum is put together by the student from the units of study offered by Vrije Universiteit Amsterdam or another institution of higher education and must at least have the size, breadth and depth of a regular Master's programme.

#### 4. Curriculum structure

##### Article 4.1 Composition of programme

1. The programme has a study load of 120 credits and consists of the following components:
  - a. required educational units
  - b. practical components
  - c. optional subjects (electives)
2. Notwithstanding the provisions of paragraph 1, students may compose their own Master's programme under certain circumstances and with the prior approval of the Examination Board.
3. The degree programme has a study load of 120 credits. One credit is equivalent to 28 hours of study.
4. Students must submit details of each study programme in the form of the so-called Personal Educational Programme (PEP) to the MNS master coordinator and to the programme's Examination Board for approval.

##### Article 4.2 Compulsory units of study

The compulsory units of study are:

###### MNS programme

###### Compulsory Courses Research Variant (57 credits required)

Course code	Course component	EC	Period	Level
X_422611	Colloquium / Literature thesis	6	Ac. Year	500
X_422613	Major research Project	39	Ac. Year	500
X_430112	Biomedical Modelling and Simulation	6	1	400
X_422610	Advanced Medical Image Processing	6	2	400

###### Society oriented Variant for Natural and Life Sciences

###### Compulsory courses (48 credits required)

Course code	Course component	EC	Period	Level
AM_1134	Internship Science in Society (BIO) Research methods for analyzing problems	30	Ac. Year	
AM_1182		6	1	400
AM_470571	Analysis of Governmental Policy Communication, Org. and Management	6	1	500
AM_470572		6	2	500

###### Compulsory Courses (54 credits required)

Course code	Course component	EC	Period	Level
X_422611	Colloquium / Literature thesis	6	Ac. Year	500
X_422615	Major research Project	36	Ac. Year	500
X_430112	Biomedical Modelling and Simulation	6	1	400
X_422610	Advanced Medical Image Processing	6	2	400

**Communication Variant****Compulsory Courses (12 credits required)**

Course code	Course component	EC	Period	Level
AM_1182	Research methods for analyzing problems	6	1	400
AM_470587	Science and Communication	6	1	500

**Compulsory Courses (54 credits required)**

Course code	Course component	EC	Period	Level
X_422611	Colloquium / Literature thesis	6	Ac. Year	500
X_422615	Major research Project	36	Ac. Year	500
X_430112	Biomedical Modelling and Simulation	6	1	400
X_422610	Advanced Medical Image Processing	6	2	400

**Education Variant****Master Leraar VHO (60 credits required)**

Course code	Course component	EC	Period	Level
O_MFDIDAC_1	Didactiek 1	6	4	400
O_MFPRAK_1	Praktijk 1	6	4	400
O_MFDIDAC_3	Didactiek 3	9	1+2+3	
O_MFPRAK_3	Praktijk 3	15	1+2+3	400
O_MFPROZ_1	Praktijkonderzoek 1	3	6	
O_MFPROZ_2	Praktijkonderzoek 2	6	1+2+3	
O_MFDIDAC_2	Didactiek 2	6	5+6	400
O_MFPRAK_2	Praktijk 2	9	5+6	400

**Compulsory Courses (48 credits required)**

Course code	Course component	EC	Period	Level
X_422615	Major research Project	36	Ac. Year	500
X_430112	Biomedical Modelling and Simulation	6	1	400
X_422610	Advanced Medical Image Processing	6	2	400

**Article 4.3 Practical exercise**

Except for those practical components incorporated in the compulsory units of study above and in relevant electives, the programme has no separate practical exercise.

**Article 4.4 Electives**

The student can take of the following electives:

<b>MNS programme</b>				
<b>Compulsory choice of at least 6 EC</b>				
Course code	Course component	EC	Period	Level
X_432765	Bio-analysis & Clinical Diagnostics	6	1	400
M_CPATHO09	Pathophysiology of Heart and Circulation	6	1	400
X_428527	Ph. of Organs 1: Cardio-Pulm. Physics	6	1	400
X_420167	Soft Condensed Matter and Bio.I Phy.	6	2	400
<b>Restricted Choice (18 credits required)</b>				
Course code	Course component	EC	Period	Level
X_432765	Bio-analysis & Clinical Diagnostics	6	1	400
AM_470726	Live cell imaging	6	1	500

M_CPATHO09	Pathophysiology of Heart and Circulation	6	1	400
X_428527	Ph. of Organs 1: Cardio-Pulm. Physics	6	1	400
X_432536	Drug-induced Stress and Cellular Respons	6	2	500
X_435047	High-Throughput Screening	6	2	500
X_422612	Image Processing for MNS	6	2	400
X_435604	Mass Spectrometry	6	2	400
X_428528	Ph. of Organs 2: Sensory Organs & Bioel.	6	2	400
X_432535	Signal Transd. in Health and Disease	6	2	600
X_420167	Soft Condensed Matter and Bio.I Phy.	6	2	400
X_422583	Dynamics of Biomolecules and Cells	6	4	400
X_420533	Elektronica en signaalverwerking	6	4	300
X_432631	Parameter Estim. Appl. to M. and B. Sc	6	4	500
X_437026	Advanced Medical Technology	6	5	400
X_428529	Biomedical Optics	6	5	400
X_435045	Protein Analysis	6	5	500
M_CPROTBI09	Proteomics in Biomedical Research	3	3+4+5	500
<b>Compulsory Choice 1 of 2 (at least 21 credits required)</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_422614	Minor research Project	21	Ac. Year	500
XM_42000	Minor research Project	27	Ac. Year	500
<b>Compulsory courses Academic Skills (6 credits required)</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_420563	Scientific Writing in English for MNS	3	3	400
X_422592	Ethics in Biomedical Research	3	3	400
<b>Society oriented Variant for Natural and Life Sciences</b>				
<b>Compulsory choice of at least 6 EC</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
AM_470575	Societal entrepreneurship H&L sciences	6	1	500
AM_470584	Business management	6	2	500
AM_470588	Disability and development	6	2	500
AM_470818	Health, Globalisation and Human Rights	6	2	500
AM_470589	Policy, Politics and Participation	6	2	500
AM_1002	Science in Dialogue	6	2	500
AM_1180	Clinical Development and Clinical Trials	3	3	500
AM_1179	Epidemiology	3	3	500
<b>Compulsory choice of at least 6 EC</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_432765	Bio-analysis & Clinical Diagnostics	6	1	400
M_CPATHO09	Pathophysiology of Heart and Circulation	6	1	400
X_428527	Ph. of Organs 1: Cardio-Pulm. Physics	6	1	400
X_420167	Soft Condensed Matter and Bio.I Phy.	6	2	400



<b>Compulsory courses Academic Skills (6 credits required)</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_422592	Ethics in Biomedical Research	3	3	400
X_420563	Scientific Writing in English for MNS	3	3	400
<b>Communication Variant</b>				
<b>Optional courses: select at least 12EC</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
AM_470572	Communication, Org. and Management	6	2	500
AM_1002	Science in Dialogue	6	2	500
AM_471014	Science Journalism	6	2	500
AM_470590	Science Museology	6	3	500
<b>Internship communication: choose one</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
AM_1162	Research Internship Science Comm.	30	Ac. Year	600
AM_1163	Reflective Practice Int. SC. Comm.	30	Ac. Year	600
<b>Compulsory choice of at least 6 EC</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_432765	Bio-analysis & Clinical Diagnostics	6	1	400
M_CPATHO09	Pathophysiology of Heart and Circulation	6	1	400
X_428527	Ph. of Organs 1: Cardio-Pulm. Physics	6	1	400
X_420167	Soft Condensed Matter and Bio.I Phy.	6	2	400
<b>Compulsory courses Academic Skills (6 credits required)</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_422592	Ethics in Biomedical Research	3	3	400
X_420563	Scientific Writing in English for MNS	3	3	400
<b>Education Variant</b>				
<b>Compulsory choice of at least 6 EC</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_432765	Bio-analysis & Clinical Diagnostics	6	1	400
M_CPATHO09	Pathophysiology of Heart and Circulation	6	1	400
X_428527	Ph. of Organs 1: Cardio-Pulm. Physics	6	1	400
X_420167	Soft Condensed Matter and Bio.I Phy.	6	2	400
<b>Compulsory courses Academic Skills (6 credits required)</b>				
<b>Course code</b>	<b>Course component</b>	<b>EC</b>	<b>Period</b>	<b>Level</b>
X_422592	Ethics in Biomedical Research	3	3	400
X_420563	Scientific Writing in English for MNS	3	3	400

If the student wishes to take a different course than the units of study listed, advance permission must be obtained in writing from the Examination Board. In case the MNW bachelor minor Biomedische Beeldvorming was not in the students bachelor programme, then the following courses are to be included in the master programme: "Biomedische Beeldvorming" and "Inleiding Medische Beeldanalyse" for the variant Medical Physics, and the courses "Mechanics and Thermodynamics in the Cell" and "Microscopy and Spectroscopy" for the variant Physics of Life and Health. The free elective space in the master programme offers the schedule opportunities to fulfill these requirements.

Students may participate in examinations [and/or practical exercises] for the units below only if they have passed the examination or examinations for the units mentioned:

The major and minor project only after 24 EC of master courses is fulfilled unless the Examination Board decides otherwise.

#### Article 4.6 Participation in practical exercise and tutorials

1. Students are expected to participate actively in all degree components for which they are registered.
2. In addition to the general requirement regarding active participation, the study guide details additional requirements for each degree component, as well as component attendance requirements.
3. At the start of each degree component, a specification will be made available which details:
  - The final attainment levels of the degree component;
  - The study guidelines for passing the degree component;
  - The way in which the final attainment levels are assessed;
  - The regulations for examinations and resits;
  - The guidance provided by lecturers during scheduled hours and otherwise;
  - Component attendance requirements;
  - The provision of feedback to the student on assignments and reports submitted, and presentations given during the degree component.
4. If a student is prevented by force majeure from attending a required degree component, then the student must send written notification of his or her absence to the examiner and the study advisor as soon as possible. The examiner may, after consultation with the study advisor, give the student an alternative assignment.
5. Absence from degree components with required attendance is only allowed in the case of force majeure.
6. In the event of inadequate participation, either qualitative or quantitative, the examiner may exclude the student from further participation in the degree component or a part of the degree component. The details of the student's inadequate participation must be recorded in advance and approved by the Director of Studies.

#### Article 4.7 Maximum exemption

Not applicable

#### Article 4.8 Validity period for results

No further specific provisions to article 4.8 of TER part A.

#### Article 4.9 Degree

Students who have successfully completed their Master's final examination are awarded a Master of Science degree. The degree awarded is stated on the diploma. If it is a joint degree, this will also be stated on the diploma.

#### Requirements for NVKF certificate

Special provisions for the Dutch Society for Clinical Physics certificate.

Students who complete the Bachelor's programme in Medical Natural Sciences and the Research Variant of the Master's programme in Medical Natural Sciences are entitled to a certificate indicating that their prior education meets the requirements of the Dutch Society for Clinical Physics for admission to the post-graduate programme in Clinical Physics.

Specifically, they must meet the relevant requirements for the Bachelor's programme (as listed in the Academic and Examination Regulations for that programme) and the following requirements for the Master's programme:

1. The following electives must be completed:
  - Biomedical Optics (6 credits)
  - Electronics and Signal Processing (6 credits)
  - Physics of Organs I (6 credits)
  - Parameter Estimation in Medical and Biological Sciences
2. The student must complete a Major Research Project MNS in the field of Medical Physics.
3. The student must complete a Colloquium / Literature Thesis in MNS on a physics topic.

4. Any deficiencies in the student's Bachelor's programme can be eliminated by choosing specific elective courses in consultation with the Master's coordinator and the Examination Board.
5. The MNS Examination board provides this certificate after consultation of MNS master coordinator.

## **5. Transitional and final provisions**

### **Article 5.1 Amendments and periodic review**

1. Any amendment to the Teaching and Examination Regulations will be adopted by the faculty board after taking advice, and if necessary approval by the Programme Committee concerned. A copy of the advice will be sent to the authorized representative advisory body.
2. An amendment to the Teaching and Examination Regulations requires the approval of the authorized representative advisory body if it concerns components not related to the subjects of Section 7.13, paragraph 2 sub a to g and v of the WHW and the requirements for admission to the Master's programme.
3. An amendment to the Teaching and Examination Regulations can only pertain to an academic year that is already in progress if this does not demonstrably damage the interests of students.

### **Article 5.2 Transitional provisions**

Notwithstanding the current Teaching and Examination Regulations, the following transitional provisions apply for students who started the programme under a previous set of Teaching and Examination Regulations:

Not applicable

### **Article 5.3 Publication**

1. The faculty board will ensure the appropriate publication of these Regulations and any amendments to them.
2. The Teaching and Examination Regulations will be posted on VUnet.

### **Article 5.4 Effective date**

These Regulations enter into force with effect from 1 September 2017.

Advice from the Programme Committee, on 20 April 2017.

Approved by authorized representative advisory body, on 6 July 2017

Adopted by the Board of the Faculty of Science, on 21 July 2017.

## Appendix I

List of articles that must be included in the OER pursuant to the WHW (articles in framed boxes):

### Section A

Art. 1.1	7.13, para 1, WHW
Art. 2.1	7.13, para 2 sub w
Art. 3.2	7.13, para 2 sub e
Art. 4.2	7.13, para 2 sub h and l
Art. 4.3	7.13, para 2 sub n
Art. 4.4	7.13, para 2 sub o
Art. 4.5	7.13, para 2 sub j, h
Art. 4.7	7.13, para 2 sub r
Art. 4.8	7.13, para 2 sub k
Art. 4.9	7.13, para 2 sub p
Art. 4.10	7.13, para 2 sub q
Art. 4.11	7.13, para 2 sub a
Art. 5.1	7.13, para 2 sub u
Art. 5.2	7.13, para 2 sub m

### Section B

Art. 1.2	7.13, para 2 sub i
Art. 2.1	7.13, para 1 sub b, c
Art. 2.2	7.13, para 2 sub c
Art. 3.1	7.25, para 4
Art. 4.1	7.13, para 2 sub a
Art. 4.2	7.13, para 2 sub e, h, j, l
Art. 4.3	7.13, para 2 sub t
Art. 4.4	7.13, para 2 sub e, h, j, l
Art. 4.5	7.13, para 2 sub s
Art. 4.6	7.13, para 2 sub d
Art. 4.8	7.13, para 2 sub k